AMERICAN ARTISAN

WARM AIR HEATING • AIR CONDITIONING
SHEET METAL CONTRACTING

AIR CONDITIONING SECTION
PAGE 47

ESTABLISHED 8 8 0

OCTOBER 1 9 3 7

MERCOID

COMBINATION FAN AND LIMIT CONTROL FOR WARM AIR FURNACES

The Outstanding Features of This Control Are Well Known to the Trade

IT IS WISE TO USE A CONTROL THAT IS EASY TO INSTALL AND ADJUST . . . ONE THAT YOU CAN FORGET ABOUT AFTER YOUR JOB IS DONE.

RELIABLE LINE OF AUTOMATIC CONTROLS FOR HEATING AND AIR CONDITIONING

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PAYS TO GE

HE BEST

NIGHT-AIR COOLING IS THE ONLY PRACTICAL HOME COOLING MOST HOME OWNERS CAN AFFORD!

(Clipping from Home Institute N. Y. Herald-Tribune)

NEW YORK
Herald Tribune

The cheapest way to be 'cooled,' . . . . . is to keep the air moving in the summer, minus the heat.

The trick is to bring in cool night air while you sleep, then close all the windows tight during the heat of the day and keep on recirculating that captured night air.

. . . . . air cooling is the most precious of the three precious gems in the valuable collection of comfort aids . . . . . .

Its effect is enhanced even in June by the other functions of summer air conditioning, notably circulation of air, plus dehumidification and filtering.

Offer This Super-Value in WINTER AIR CONDITIONING plus SUMMER COOLING

If a home-owner tried to buy individually all the many features included in ALL-YEAR-AIR, the total cost would be prohibitive. But the great purchasing power and production facilities of Auburn Automobile Company make it possible to offer ALL-YEAR-AIR, with all its special advantages, at a price that is within easy reach of every home-owner—12-months-in-the-year Comfort! Summer Night Air Cooling (described in the N. Y. Herald Tribune clipping) and Winter circulation of air that is correctly tempered, filtered and humidified; only possible with ALL-YEAR-AIR.

9,000,000 HOME MARKET!

Nine million warm-air heated homes in the United States need ALL-YEAR-AIR. Their owners want it; and now they can easily afford to buy and operate it. The only unit that includes 8-Speed Circulating Fan, adaptable to all seasons; humidification, automatically controlled; double-capacity filter; Ozonizer, Ionizer and complete control panel. Don't be satisfied to sell a one-season product when you can build year-round sales and profits with ALL-YEAR-AIR. Write us for Auburn's liberal proposition and details of sales co-operation.

AIR-CONDITIONING DIVISION, AUBURN AUTOMOBILE CO.
General Sales Office, 2426 Michigan Ave., Chicago
Factory, Connersville, Indiana

ALL-YEAR-AIR CONDITIONED

In This Issue

THE autumn scene in this month's cover illustrates a phase of air conditioning which has already aroused considerable attention and will, in our judgment, be an increasingly important activity. We refer to air conditioning for fruit and vegetable storage, for poultry and livestock production and year round comfort. An article on page 60 starts a series on this field of work.

★

The production of cabinets began as a fill-in job for the Steinberg company in Newark. (See page 20.) The production has grown to the point where 50,000 cabinets were fabricated in 1936. The history of this unusual operation should be interesting to all large shop owners.

★

On page 24 appears the first article in a new venture for this publication. We have appointed Arnold Kruckman our representative in Washington. It will be his job to ferret out the happenings which have or are or will affect this industry and interpret these happenings for you. What lies behind—who is the motive force—what is supposed to take place—these and other "behind the scenes" reports will appear regularly.

★

Joseph G. Dingle, on page 30, raises the question of how to keep track of costs and profits on "appliances"—in other words, on the products you now sell without any shop labor being involved. He points out that selling price is "ceilinged" and without labor, profit is restricted to a definite range. His suggested separate account seems to us to be the ideal solution.

★

With oil burning equipment so widespread in application the report of the University of Illinois Research staff on oil burning furnaces on page 53 should be timely. A specially designed oil burning furnace was tested against a coal fired, cast iron, furnace with a conversion burner. The results should give every contractor a clear insight into the limitations of these types of apparatus.

★

S. Konzo continues his discussion of checking systems and apparatus on page 62. As the articles progress he will explain how testing instruments should be used to ascertain just what any given system or piece of equipment is doing. If you have questions on checking send them to us.

★

In this month's discussion of the new technical code we compare equivalent lengths with actual lengths, correct our air volumes and temperatures and get all set to size the branches and main ducts in November.

AMERICAN ARTISAN

With which is merged

FURNACES AND SHEET METALS AND Warm-Air Heating

Covering All Activities in

Gravity Warm Air Heating — Forced Warm Air Heating
Sheet Metal Contracting — Ventilating
Air Conditioning

J. D. Wilder, Editor

A. A. Kennedy, Assistant Editor — Brewster S. Beach, Consulting Editor

Vol. 106, No. 10 — October 1937 — Founded 1880

CONTENTS

A Job for Jobbers—Winter Selling 19
50,000 Cabinets in 1936 20
Termites (How to Combat Them) 22
Arnold Kruckman's Washington Letter 24
Metal Shingles 26
Ventilating a Bowling Alley 28
Are Your Sales Properly Classified? 30
The Fort Wayne Licensing Ordinance 33
Association Activities 95
New Products 97
News Items 100
With the Manufacturers 102
New Literature 104

THE AIR CONDITIONING SECTION

Oil Burning Furnaces in Research Residence 53
Neubecker's Patterns for A. C. Fittings 57
Air Conditioning in Wisconsin Agriculture 60
Konzo on Checking Chimneys 62
The New Technical Code 64
Heating a 325,000 Btu House 66

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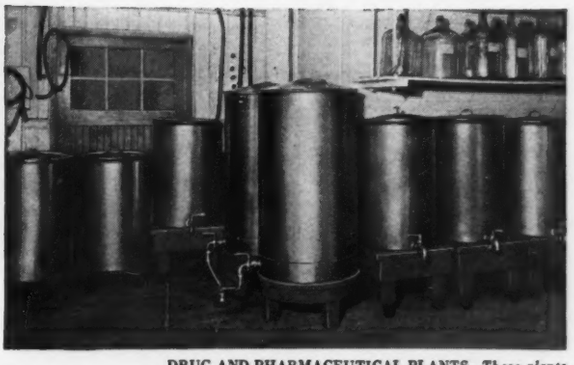
More than 8,000 Copies of this Issue are being distributed

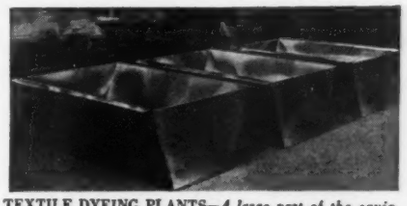
There's MONEY *in* MONEL

. . . and You can make it!

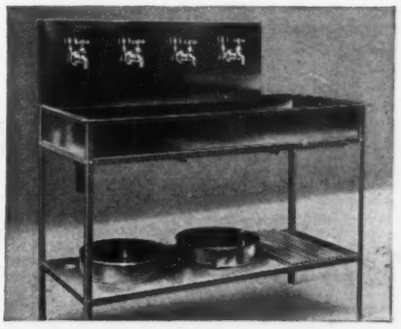


LEATHER TANNING PLANTS—*The tables where colors are applied to fine leathers in tanneries are called "brush color tables." Many tanneries have had these tables covered with 20 gauge Monel sheet to resist the action of the dyes and to provide a smooth, readily cleanable surface ready for the application of a new color. This kind of work is right down your alley and right now tanneries are interested in having you do this work for them.*

DRUG AND PHARMACEUTICAL PLANTS—*These plants use a great variety of stationary and portable tanks for holding essential oils, extracts, elixirs, etc. Monel and Nickel are ideal construction materials and are widely used to prevent harmful metallic contamination during manufacture and in storage prior to bottling. There's real business for the live sheet metal worker in all these plants.*



TEXTILE DYEING PLANTS—*A large part of the equipment of any dyehouse consists of tanks either self-supporting or lined tanks of wood or metal. Monel is a standard construction material for dyehouse equipment. While new equipment is generally constructed of Monel, there is plenty of business in fitting sheet Monel linings in existing wood and metal tanks. Lock-seamed joints, silver-soldered inside and soft-soldered outside, are used. Typical 20 gauge Monel linings are shown above.*



PHOTOGRAPHIC SINKS—*The Monel sink, shown above, is 5' long x 30" wide x 6" deep. The body, splashback and shelf are all Monel 22 ga. No. 8 finish. The two round pans show a rubber tube connection on the sides for filling with water with an overflow opening at the top of pan to allow a continuous flow of water to run out into the sink, in which the pans are placed for washing negatives and prints.*

Many drug stores and stationery dealers, as well as commercial photographic laboratories, now do photo finishing. Monel does the job. You know how to build the sinks.

Tell local plants you fabricate Monel and land profitable jobs like these.

TAKE a look at the Monel* tanks and table tops, etc., in the above pictures. Did you ever see sweeter jobs for any sheet metal shop? Quality work, good prices, and reasonable profits . . . all yours when you work with Monel.

Take advantage of Monel's fine reputation. Build *your* reputation as a Monel fabricator at the same time—it will pay you well. For Monel has been the preferred metal for years in dozens of plants right at your back door. And there are lots of additional jobs for Monel in these same and other plants . . . places where Monel could be used—*and will be used* the minute a smart sheet metal man points out the need.

If you've never gone out to sell your work in Monel just take a crack at it. Local plant managers are glad to hear that *you* fabricate Monel. And, as you probably don't need to be told, Monel is one swell metal to fabricate . . . just the right temper for ready working, yet tough enough to stand the gaff in service.

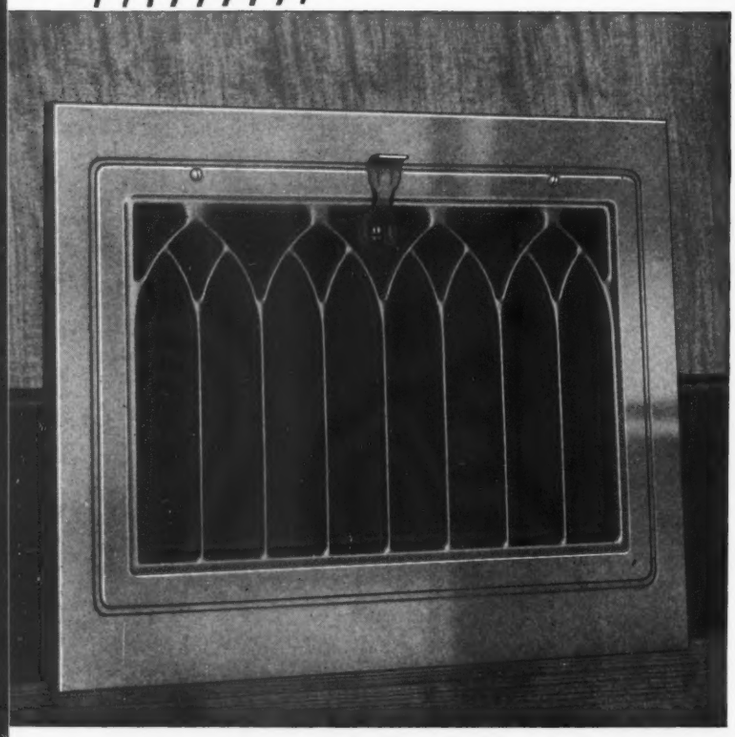
To help you get the most out of Monel, we've prepared four bulletins. You'll find them practical, instructive and easy to read. So write for your copy of "Practical Considerations in Dye Tank Construction," "Monel and Nickel in Tanneries," "Monel and Nickel in the Manufacture of Pharmaceutical, Fine Chemicals and Proprietary Products" and "Monel and Nickel in the Chemical Industries." Address:

THE INTERNATIONAL NICKEL COMPANY, INC.

67 Wall Street New York, N. Y.

*Monel is a registered trade-mark applied to an alloy containing approximately two-thirds Nickel and one-third copper. This alloy is mined, smelted, refined, rolled and marketed solely by International Nickel.

H&C Month after Month THESE REGISTERS establish New High Sales Records!



Month after month these three exceedingly popular members of the H & C Gravity line continue to break all previous sales records —continue to win new friends in all parts of the country—a sure indication that in the minds of those installers who know that it pays to handle the best registers obtainable, these are "tops".

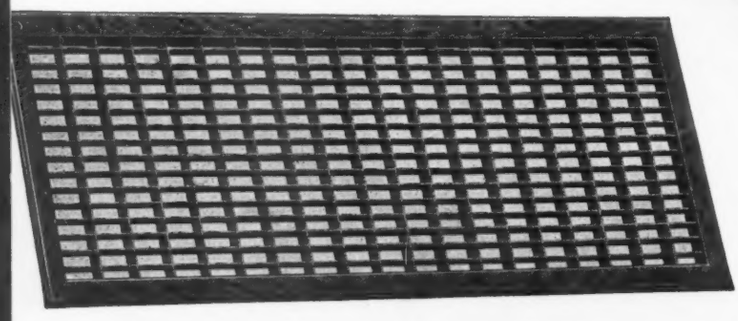
Look them over at your H & C Jobbers'. Just a glance at their fine construction and excellent appearance will reveal those superiorities which have caused leading installers to go for them in such a big way.

The H & C line is the most complete of any on the market today. It offers the ideal register for every type of installation whether it be Air Conditioning or Gravity.

No. 37 General Catalog and No. 37 Air Conditioning Catalog on request.

The H & C No. 120 Baseboard Register shown above combines the most popular face design ever incorporated in a baseboard register, with a construction that permits the stackhead to be lapped over the register frame—insuring a very neat, tight installation.

In the H & C No. 265 "NO-FLEX" Return Air Face, many superior features of construction are combined. Mesh is $\frac{1}{8}$"x1$\frac{7}{16}$". Cross members are welded to each other and to the frame for maximum strength. Upper edges of members are squared for better walking surface. Corner joints are invisible. Margins are narrow for close installation.



Shown above is the H & C No. 210 "NO-FLEX" Floor Register. Similar in construction and appearance to H & C No. 265 Return Air Face. Exceptionally rigid, with mesh openings $\frac{7}{16}$"x1$\frac{7}{16}$". A very sturdy, heel-proof register for which no premium price is asked.

HART & COOLEY MANUFACTURING CO.

Warm Air Registers
Damper Regulator Sets
H&C
Air Conditioning Grilles
Dampers, Chain, Pulleys

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MACHINABILITY

With our free-machining stainless steels (U·S·S 18-8 and U·S·S 12 FM) automatic screw machines can machine any pattern which can be machined from ordinary Bessemer screw stock.

WELDABILITY

U·S·S Stainless Steel can be neatly welded with either flame or electric equipment. For applications involving severe corrosion, use U·S·S 18-8 Stabilized, which can be welded with absolutely no loss of corrosion-resistance.

DEEP DRAWS

U·S·S Stainless Steel is one of the most ductile of all metals, thus making possible new designs drawn to amazing depths in a single operation.

CUT OR DRILL

To cut or drill stainless steel successfully, remember that all stainless steels harden quickly on cold work. With deeper cuts, slower speeds and sharp tools, U·S·S Stainless Steel machines easily.

TWO of the greatest virtues of stainless steel are its high mechanical strength and its tendency to harden under cold work. Yet when stainless steel was still new, these two properties caused some people to conclude that this useful metal was workable only with great difficulty by standard shop practice.

Today, workability is no longer a problem to those who know stainless steel. Through a better knowledge of the nature of the metal — through practice in skillful fabricating techniques—and finally through the development of special modifications for special purposes (free-machining, free-spinning, etc.), it is today entirely practical to work stainless steel by every artifice of the metal worker, extrusion alone excepted.

There is no other metal offering anywhere near the high physical properties of stainless steel nor its high corrosion-resistance which can approach this workability.

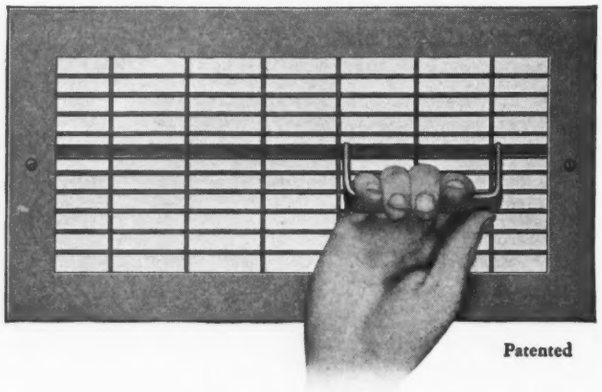
Don't let any problem in workability keep your product from enjoying the selling advantages of stainless steel. Ask us for a new illustrated circular on the fabrication of stainless steel or for specific recommendations on your specific problem.

U·S·S STAINLESS STEEL

AMERICAN STEEL & WIRE COMPANY, *Cleveland, Chicago, and New York*
CARNEGIE-ILLINOIS STEEL CORPORATION, *Pittsburgh and Chicago*
NATIONAL TUBE COMPANY, *Pittsburgh*
Columbia Steel Company, San Francisco, *Pacific Coast Distributors* · United States Steel Products Company, New York, *Export Distributors*

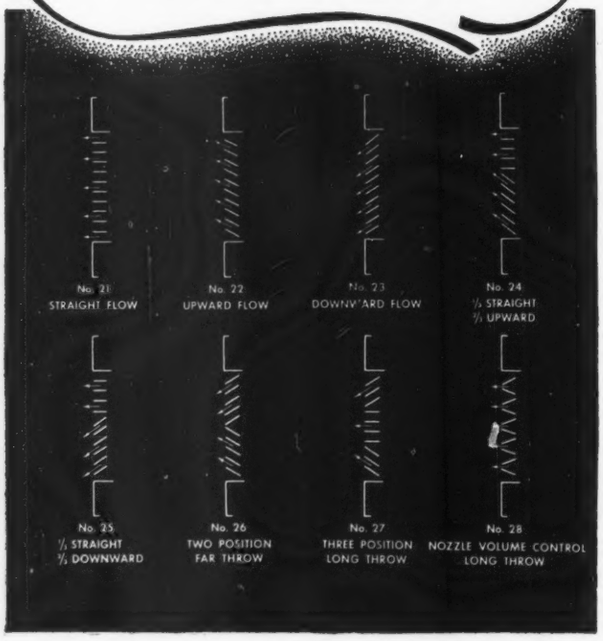
UNITED STATES STEEL

INDEPENDENT "FABRIKATED" *Adjustable*
DIRECTED AIR FLOW REGISTERS AND GRILLES
Distribute, Concentrate or Deflect Air Flows with Unequalled Precision



Patented

INDIVIDUAL ADJUSTMENT OF GRILLE BARS EFFECTS THESE AND MANY OTHER DEFLECTIONS OF AIR FLOWS



Two-Prong Tool Makes Adjusting *Easy at Any Time*

• Before installing, or after the register is in place, any grille bar can be set at any angle to produce any desired deflection of air flow... It is not necessary ever to take out the register after it is once in place; for no locking is required to hold the grille bars firmly in place. Grille bars are so mounted and further secured by cross members that they are rattle-proof, tamper-proof and vibration-proof. The special two-prong tool is required to change adjustment, and with this special tool it is an easy matter.

With individual adjusting of grille bars, heating engineers can achieve effects in air flows impossible in any other way.

Independent "Fabrikated" *Adjustable* Directed Air Flow Registers and Grilles are made in any size with either vertical or horizontal grille bars to deflect air flows right or left, or up or down, to any desired angle. They are unexcelled in strength, rigidity, appearance and range of directed air flow.

Write for catalog and data book.

THE INDEPENDENT REGISTER COMPANY

3741 East 93rd Street, Cleveland, Ohio

A few recently-built houses... all with

Anaconda Economy Copper Roofing

1936 "Good Housekeeping" House in Wychwood, Westfield, N. J.
Architect: *Dwight James Baum, Riverdale-on-Hudson, N. Y.*

PROVIDING all of copper's traditional charm and dignity, Anaconda *Economy* Copper Roofing is offered especially for residential use. Lighter weight (10 oz. metal) reduces cost. Narrower sheets (13¾" between seams) are more in keeping with small roof areas, and provide approximately the same rigidity and wind resistance as wider sheets of heavier metal. You have the men, the tools, the experience to go after this profitable business. Stocked by Anaconda distributors.

ANACONDA

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THE AMERICAN BRASS COMPANY
General Offices: Waterbury, Conn. *Offices and Agencies in Principal Cities*
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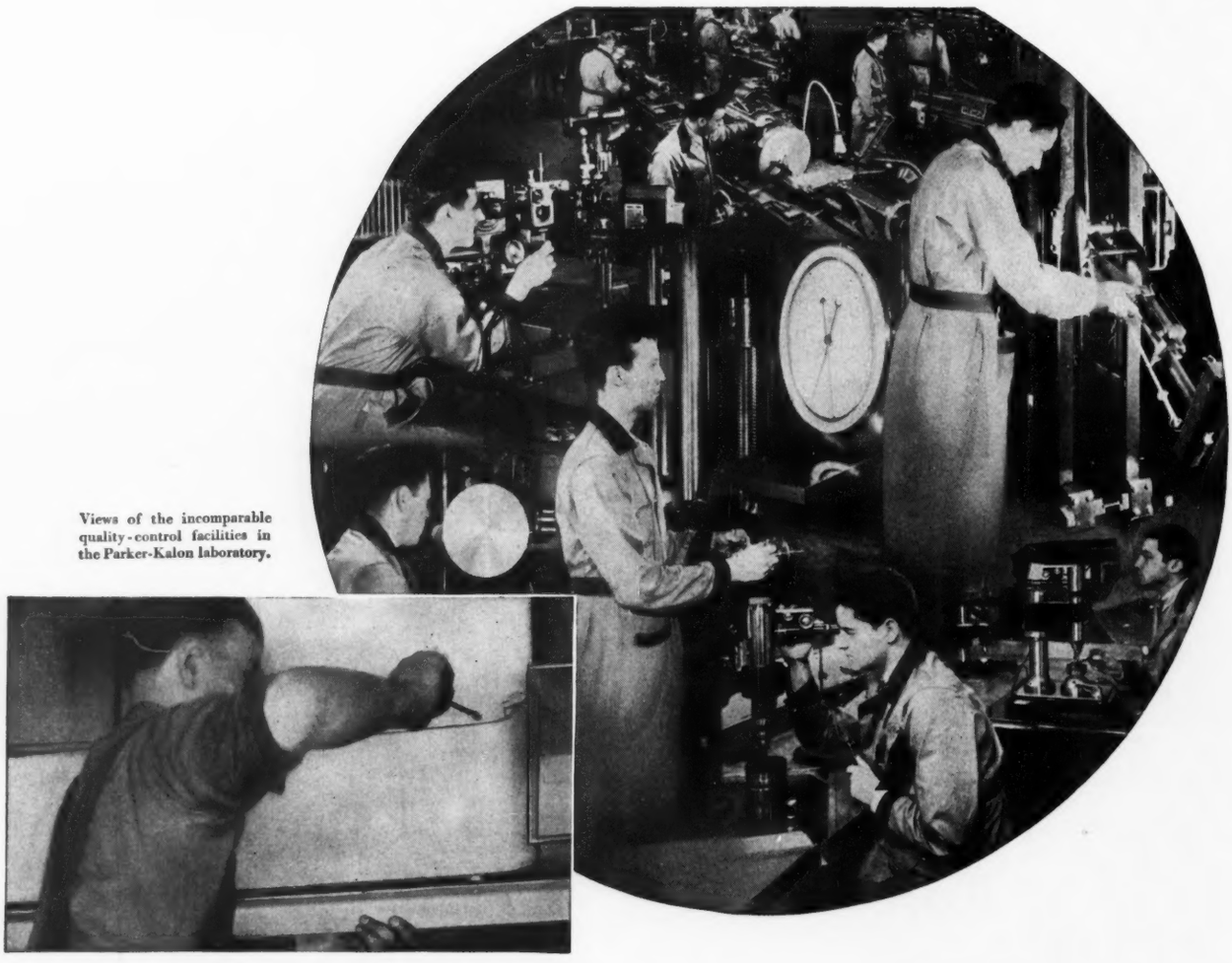
"Character Home" was built by Hutzler & Carr, Inc., in Richmond, Va. Architect: *Edward F. Sinnott, Richmond, Va.*

Built in Marblehead, Mass., and designed by Donald C. Goss, Architect, *Boston, Mass. Copper was used extensively throughout.*

Here copper graces a really "small house," built as a Model F. H. A. home by Andrew H. Larsen at Waterbury, Conn.

This home with Anaconda Copper roof is in Newton Highlands, Mass. Built by Davis & Vaughan, Boston, Mass.



Views of the incomparable quality-control facilities in the Parker-Kalon laboratory.

YOUR SAFEGUARD against ASSEMBLY TROUBLE

. . . is the famous Parker-Kalon "quality-control" staff that keeps genuine Sheet Metal Screws uniformly good

There's a simple reason for the *uniformly perfect results* that genuine Sheet Metal Screws give you. Parker-Kalon applies unequalled facilities and experience to controlling their quality.

Nothing like Parker-Kalon's equipment for securing and controlling the essential qualities of screw products has ever been known in the industry. Every modern scientific and mechanical aid is available to the staff of experts who watch over materials and processes.

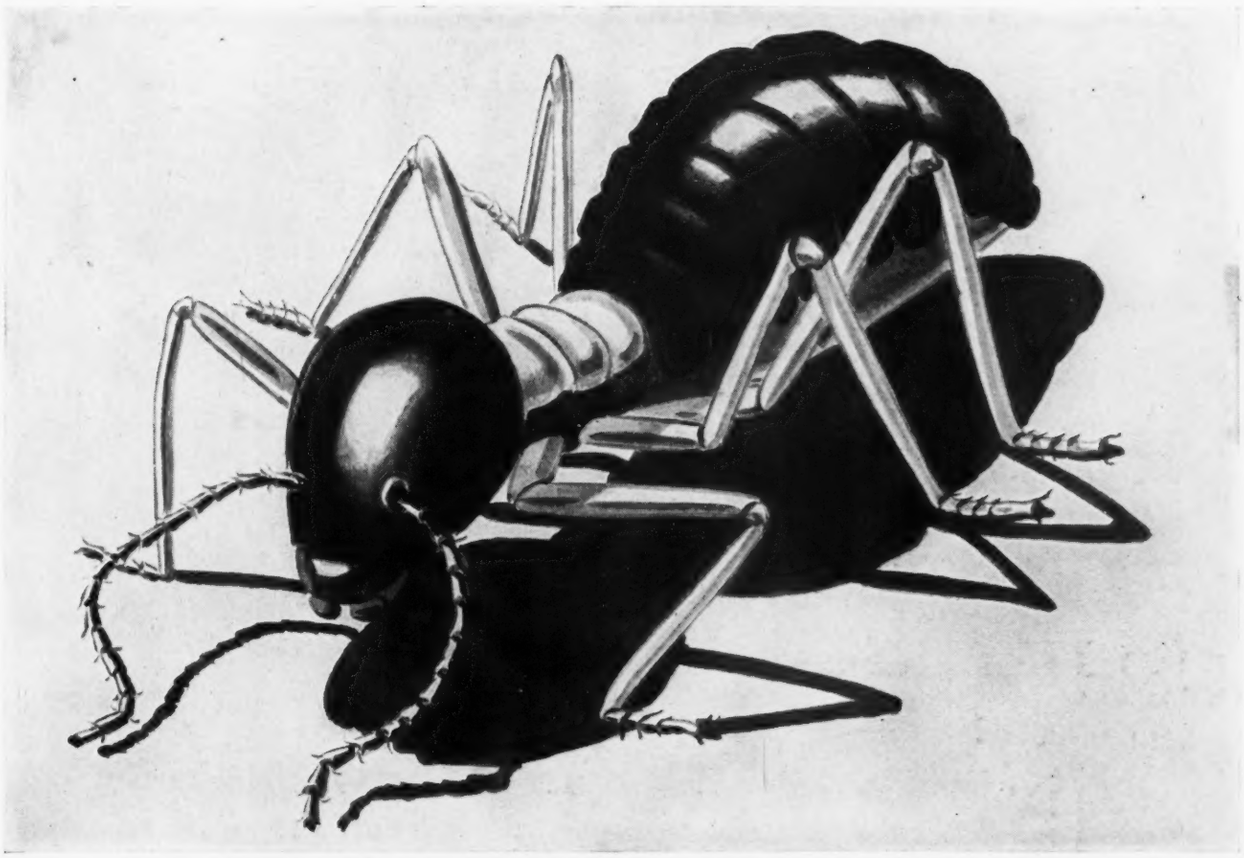
Into the making of genuine Sheet Metal Screws, also, goes Parker-Kalon's 25 years of experience. This superior knowledge is bound to be an important help in making screws to *work right every time.*

Make certain that savings of assembly time and labor will not be wiped-out by trouble. Specify "*Parker-Kalon*". Every Screw in a boxful is uniformly good...sure to go in easily...without stripping threads or twisting off heads...sure to hold.

PARKER-KALON CORPORATION
190 Varick Street New York, N. Y.

HARDENED
PARKER-KALON SHEET METAL SCREWS
SELF-TAPPING

SOLD ONLY BY RECOGNIZED DISTRIBUTORS



TERMITES ARE PESKY THINGS—
But They Mean Business

The march of the wood-eating termites over the country is frightening home owners.

Editors and writers in newspapers and magazines are warning people everywhere.

Termites are pests of the worst order—but they mean business for sheet metal men.

Experts agree that only one thing stops them—and that is sheet copper between house and foundation.

The edges of the copper sheet are bent at an angle so that the voracious insects can't get by. They are great organizers and builders. They bridge over brick, stone and piping with "shelter tubes" in their efforts to reach the woodwork. Rustable materials sooner or later give them access. But sheet copper keeps them permanently out.

Revere Sheet Copper is the ideal material to standardize on in this new work as well as for gutters, ridges, flashings, downspouts, decks, hoods and other usual applications.

Comes in hard and soft tempers, and in a variety of finishes for all requirements. Plain or lead-coated. Sheets, strip or roll.

Free Folder—"What to Do About Termites": A copy of this new folder will be sent you free on request. Ask for it. Please address your request to our Executive Offices, 230 Park Avenue, New York, N. Y.

Revere Copper *and* Brass

FOUNDED BY PAUL REVERE 1801

INCORPORATED

Executive Offices: 230 Park Avenue, New York City · Mills: Baltimore, Md. · Taunton, Mass. New Bedford, Mass. · Rome, N. Y. · Detroit, Mich. · Chicago, Ill. · Sales Offices in Principal Cities

PRESENTING

AUER

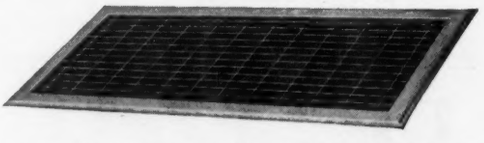
"DURABILT"

An Assembled Register-New and Better

Floor Registers *and* Cold Air Faces.....

Here's real news! AUER has now added to its already popular line a perfected *assembled* register—of the steel-bar *constructed* type—with *locked* mortised joints and welded frame. A new AUER plant, with splendid new equipment, now has these BETTER Registers ready for you. Severely tested for strength, DuraBilt Registers meet the demand for a *finer* product at a *practical* price. Without sacrifice of true craftsmanship in manufacture, or good taste in appearance, DuraBilt Registers bring *YOU* a *New Measure* of *Economy* and *Value*. All popular sizes and finishes. Write at once for DuraBilt Descriptive Folder and Prices!

- Multi-Lock assembly for Super Strength and Extra Rigidity.
- All-steel bars—mortised at joints, close-fitted.
- Face interlocked to frame at every connection.
- Ample capacity for air-flow.
- Auer medium-size mesh is close enough to exclude small objects, but narrow mesh can be furnished if preferred.
- A design subdued in character, most pleasing in effect.



THE AUER REGISTER COMPANY, 3608 PAYNE AVENUE, CLEVELAND, OHIO

AUER DISTINCTIVE REGISTERS & GRILLES For Air Conditioning *and* Gravity

THIS JOB IS "PLENTY TOUGH" ON SHEETS

SUPERIOR GALVANNEALED excels for outside work—such as collectors—and interior pipe and fittings subject to corrosion from condensation and moisture. This sheet has a hot-dipped zinc coating, heat-treated — providing an ideal surface for paint, lacquer or enamel finish.

● To insure leak-proof blow pipe work, sheets get plenty of abuse in forming, pounding and riveting. A sheet must be "plenty tough" to stand the gaff in a blow pipe shop without fracturing at seams and rivet holes.

"We specialize in blow pipe work which is very exacting and that's why we prefer SUPERIOR Sheets. Good work requires good sheets and we certainly pride ourselves on our work."

SUPERIOR sheets are uniform — flawlessly coated — the finest sheets that money can buy.

THE SUPERIOR SHEET STEEL CO.
Canton, Ohio
Division of Continental Steel Corporation

SUPERIOR

OPEN HEARTH STEEL SHEETS

SUPERIOR GALVANNEALED
"SUPER-METAL"

GALVANIZED SHEETS
GALVANIZED ROOFING

HOT ROLLED ANNEALED
PICKLED and

HANDY PIPE

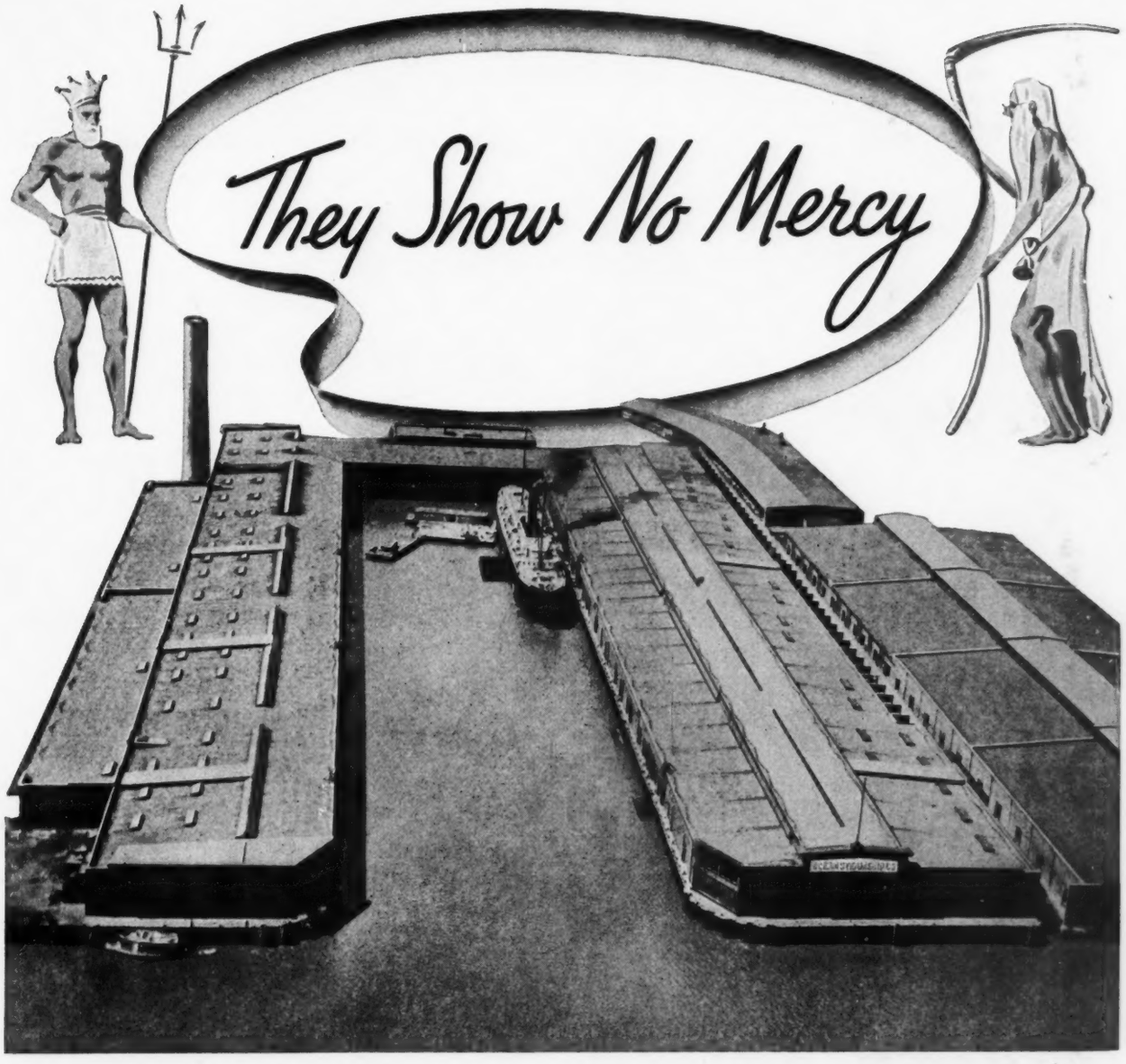
The INDUSTRY'S LEADER—

It leads warm air from source to outlet—with or without "force" and free from friction—

And it leads the way to more certain profits by reducing labor costs and being pre-fabricated to the most exacting standards for individual jobs.

F. Meyer & Bro. Co., Peoria, Ill.

Our Catalogue No. 50 is a free guide to everything needed in the installation of warm-air furnaces and air-conditioning systems.



When King Neptune teams up with Old Man Time, you have war to the finish for any sheet metal. And sometimes it's an embarrassing quick finish for metals that "can't take it."

Yet in this installation galvanized ARMCO Ingot Iron has withstood the corrosive effects of salty ocean breezes for more than twenty-one years. When this giant steamship terminal was erected in 1916, ARMCO Ingot Iron was used for siding, cornice, flashing and skylights. It has fought off the elements successfully and, when recently inspected, was found to be in first-class condition.

This convincing evidence can help you sell ARMCO Ingot Iron sheet metal work. Such long-established records of actual service give your customers confidence to buy the slightly more expensive and better metal. Profitable sales come easier to you as a result.

The nearby Armco Distributor has ample stocks of galvanized ARMCO Ingot Iron for quick deliveries. Place that next sheet metal order with him. And ask him, too, about his helpful Armco promotional services. The American Rolling Mill Company, 1690 Curtis Street, Middletown, O. District Offices in All Key Cities.

ARMCO

Armco Ingot Iron

Confidence BUILT ON SERVICE

PRINTED IN U.S.A.

Luscious Lips

DEPEND ON STEEL

Every year the women of America demand 327 tons of steel for their lipstick holders, as well as thousands of tons for their hairpins, bobby pins, dress hooks, snaps and zippers. The average woman carries on her person 89 pieces of steel, the average man 110.

Stop for a moment and you'll realize that actually all phases of your life and luxury depend today on *steel.* Without steel there would be no newspapers, no heat in buildings, no automobiles, no movies, no machinery, no telephones, no electric lights. *Without steel there would be no civilization.*

For its thousands of uses there are hundreds of kinds of steel, many of them developed here at Youngstown for the special purposes they must serve. Youngstown has poured millions into research, to find better steels, to better serve expanding human needs. This research has developed scores of new products, created thousands of jobs and made many of the articles you use last longer, cost less and serve you better. This research is continuing -- we like to think of it as our contribution toward more widespread comfort, safety, security. That is why you, the user of sheets, can *depend on Youngstown.*

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon and Alloy Steels

General Offices - - YOUNGSTOWN, OHIO

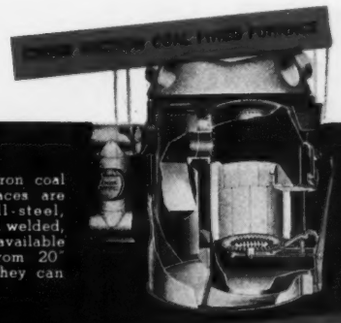
Sheets - Plates - Pipe and Tubular Products - Conduit Tin Plate - Bars - Rods - Wire - Nails - Unions - Tie Plates and Spikes

25-1A

QUALITY YOUNGSTOWN SERVICE

YOUNGSTOWN

The Cheviron coal fired furnaces are heavy, all-steel, riveted and welded, and are available in sizes from 20" to 34". They can



be purchased either with round or enameled square casing, for either gravity or winter air conditioning heating.

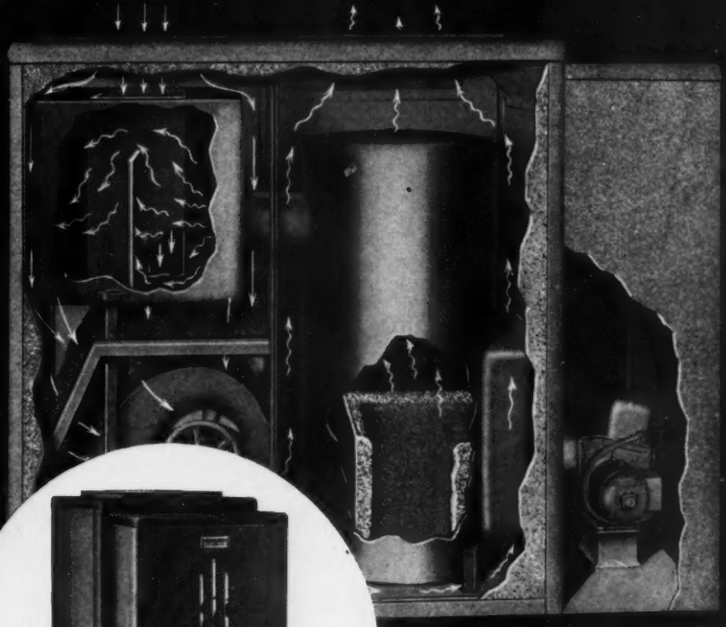
THE CHEVIRON COMPLETE LINE OF STEEL FURNACES ARE *Designed* AND *Priced* FOR THE VOLUME MARKET

The Cheviron line is a complete line—whether the furnace is coal, oil or gas we have a size and a style for your needs.

The coal fired furnaces are heavy steel, riveted and welded, available in both round and square casing for either gravity or winter air conditioning heat.

The Gas or Oil Fired Series are rugged, all-steel welded and designed to operate with equal efficiency burning either fuel.

Each Cheviron furnace sold is backed by one of the largest manufacturers of steel furnaces in the world. Only such engineering and manufacturing facilities as these can give you America's finest furnaces at America's most popular prices.



GAS OR OIL FIRED SERIES

No gas or oil fired furnace made is more efficient with either fuel than the Cheviron Gas or Oil Series. Ideal because you have only one style to handle.

Made in five sizes—from 125,000 BTU output to 300,000. Can be purchased with or without either burner and controls. Beautifully finished in ripple green enamel.

AMERICA'S FINEST FURNACES

MICHIGAN TANK & FURNACE CORP.
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Gentlemen:
Please send complete information and prices on the Cheviron complete line.

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WHERE TO BUY IT?

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The sheet metal shop that is "going places" today has calls for many items which were little known a few years ago. New metals with almost countless applications in homes and factories, winter air conditioning, ventilating, roofing, etc., each presents its own individual problems. Not the least of these is a prompt, dependable source of supply.

Where to buy—and buy with confidence—the many and varied products you require? You'll find the answer in the new No. 37 OSBORN Stock List. This conveniently arranged 210 page catalog contains the needed information on practically every material, equipment, fitting and supply, as well as all of the machinery and tools which a sheet metal man uses. That is what makes it an invaluable reference book to him. If you do not have one, and operate in the territory which we serve, we will be glad to see that you get a copy.

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Metals and Metal Products

A DEPENDABLE SOURCE OF SUPPLY FOR 79 YEARS

AMERICAN ARTISAN

Volume 106 Number 10

A Job for Jobbers

We were talking not long ago with one of the smartest contractors in Ohio. A contractor who for many years has always discounted his bills—even when he had to buy money from the bank to do so. For many years this contractor devoted all of his energies to large sheet metal and ventilation work. Recently (like hundreds of other large operators) he attempted to do installation of domestic winter warm air air conditioning.

This contractor has cost records extending back over many years. He knows to the penny just how much it costs him to fabricate and erect metal work. The actual cost—without any profit added—is just around 30 cents per pound.

This contractor quickly found that in his area business could not be secured unless the metal work was fabricated and erected at not over 18 cents per pound plus less than legitimate profit.

The answer is—who takes work at these prices and how can they operate?

This contractor says the answer is—Most of the residential winter air conditioning work is being installed by small shop owners and by operators **who have no shop, no tools, no truck, no financial responsibilty.**

How can they operate?

In this particular town, hungry jobbers let these operators use the jobber's shop and tools, even truck the material to the house. And, worse yet, these same jobbers grant credit sufficient to buy the sheets and solder and rivets and paint necessary to do the work.

The jobbers protect themselves in some cases by collecting for the job as it goes along. But in too many cases they lose their money because these operators are not to be trusted and have no sense of appreciation.

These jobbers ask the same prices for material from the contractors who buy large quantities and discount their bills. In other words, the contractor who pays his bills carries the losses of the contractor who has little excuse for existence.

In some areas the jobbers are cooperating with legitimate contractors and contractor associations to weed out this unfair practice. Surely the jobbers will profit in the end if they cooperate. If jobbers and contractors work together prices can be raised, profit can be made and a legitimate business established.

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Winter Selling

From all parts of the country comes word that this fall is likely to be the busiest season the warm air heating industry has experienced in a long time. It has not been unusual to hear of contractors with so much work booked that they are beginning to worry about enough mechanics and time to make installations before winter arrives.

After such a busy season many may feel the urge to let down in selling activity and coast through the holiday season. In our estimation nothing can be more detrimental to a volume of winter and spring work.

The thing likely to happen is that prospects not actively solicited will feel the urge to make the coming holidays more festive than usual and January will find pocketbooks depleted and householders trying to meet year-end obligations.

Perhaps our industry should take a page from the sales book of the refrigerator and radio fields. Very soon, now, national magazines will flower with picture of the "whatsis" refrigerator all tied up in cellophane and pink ribbon with the admiring wife, happy children and "pleased-as-punch" father exclaiming over the royal Christmas gift.

The practical advantages which these products can bring are not to be compared with the advantages of modern warm air heating and winter air conditioning. We do not have to show savings in pennies. We do not have to distort medical science to prove that winter air conditioning returns many dollars in better health. Tens of thousands of house owners attest to the great comfort of draftless, warm floor, cleanly ventilated rooms. Millions of words have been written on the benefits of adequate, controlled humidification.

The season to sell these advantages is in the winter time. No home owner can refute advantages when his house is cold, his family sniffling from chilly temperatures or dry air, his children kept off the floor because of drafts or his coal pile melting away because of a poor heating plant.

To those manufacturers who have advocated selling heating equipment in the winter time, we add our approval. Between now and the end of the year has every advantage as a selling season.

By R. C. Nason

The lockers, household cabinets, cellarettes are shown at the left in several models, finishes, colors. Fabrication of these units has replaced architectural sheet metal work as the major activity of the Steinberg company.

50,000 Cabinets in 1936

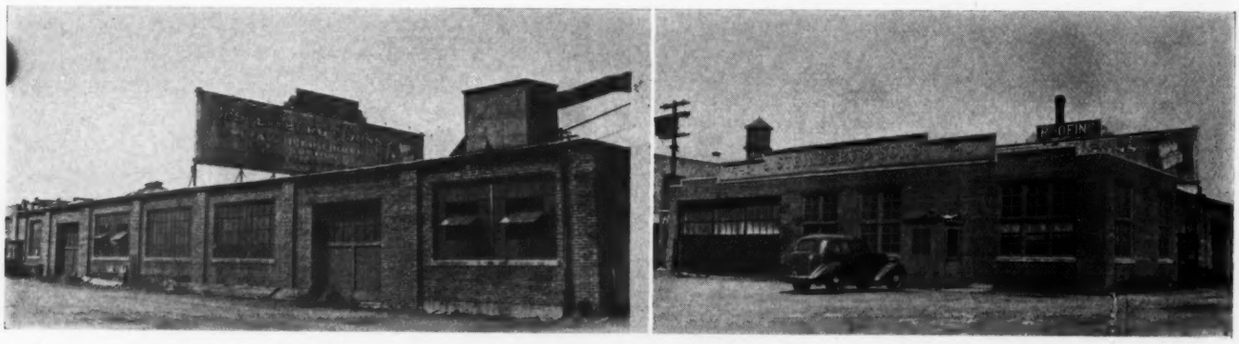
STEEL cabinets and locker fabrication, entered upon four years ago by J. Steinberg & Sons, Newark, N. J., experimentally to bolster depressed architectural sheet metal work, has proved a life-saving raft that enabled this 38-year-old contracting firm to soar to new business heights. So rapidly has their cabinet division grown, in fact, that it now represents the great bulk of business handled.

Tracing the history of the company, it might be related that its founder, J. Steinberg, bought his first brakes and shears right after the Spanish War. Until recently, general sheet metal contracting was the sole objective. Along came repeal and the Steinberg's, for two sons, Irving and L. J., had joined the firm by this time, began to manufacture beverage coolers. So satisfactory were results that additional dies and equipment were installed so that steel lockers, cabinets, cellarettes and like products also could be turned out. Last year they completed about 50,000 units.

Perhaps the leader in the Steinberg cabinet line is a "moth-proof" clothes cabinet that actually is moth-proof—not like many such things that are advertised as proof against destructive insects but aren't. Success of the Newark company's cabinet generally is attributed to double doors. The inner door butts against a full metal gasket, two door locks insure positive tightness.

Down the center of the outer door is a 4-inch-wide stiffener into the top of which can be placed moth-proofing chemicals of various sorts. The outer door has one central high class fastener that closes this door fast against the inner door thus making a full seal all around.

Another headliner is a simple kitchen utility cabinet for miscellaneous storage, brooms and building cleaning impedimenta. Lke the clothes cabinets, all corners and plane-surface edges are



Two exterior views of the Steinberg shop. The large sign faces a busy railroad line.

reinforced. Doors are strengthened both by inner 4-inch wide vertical stiffeners and by exterior narrow vertical grooves.

A third popular item of the line is a cellarette with a chromium-plated tubular frame and top beverage rim, the latter to prevent overturning of glasses. A bottom shelf acts as a stiffener besides being convenient for storage. Whereas in this model there is a front door to the major compartment, another model permits lifting of the top to reach the storage section.

From the foregoing it is observed that J. Steinberg & Sons have a rather complete assembly of cabinets to sell. Surprisingly, the shop procedure required in their fabrication is much alike for all models. The firm has built up a full range of expensive dies. These with cornice brakes and punch presses for die application, constitute the major investment. The operations also make liberal use of the five electric spot welders. Mechanical skill in setting and changing dies, and operating brakes and presses is a factor of vital importance.

J. Steinberg & Sons, recognizing the desirability of mass production as a means to low overhead in shop cost, do not try to use outmoded or faulty machinery. If stock dies are not available, the company has the necessary dies made, often at a cost ranging from $100 to $500 each. Altogether the company owns some $25,000 worth of dies.

In making the Steinberg cabinets, which are marketed under the name of Artline Metal Products, stamping and spot welding comprise major operations. Stamping is effected in as few operations as possible. For example, side pieces are stamped with champfered corners and ½-inch flanges in a single operation. Tops, bottoms and shelves also are stamped in a single operation for each piece. Ability to accomplish this rests entirely in the perfection of dies and the skill of the mechanics.

Cabinet corner strength is effected, at least in part, by placing the side flanges together, then spot-welding them on 6-inch centers throughout their entire length. Caps and bottoms fit exactly, and are also spot welded to bodies. Shelves, being flanged before assembly, are welded to cabinet sides at proper points. No bolts are evident in any of the items.

Irving Steinberg, in charge of the cabinet department, declared that appearance must be a dominant factor in the sale of his company's products. This is procured through care in fabrication—to insure perfect fit of tops, bottoms and doors—and painting. Following initial assembly, pieces go to the painting room. Here, in a large spray booth, paint is applied by machine. Precautions are taken against street dust through tightness of windows, which are not open at any time. Ventilation is secured by a large exhauster attached to the apex of the spray booth. One of the favorite finishes is known as "crystal", wherein snow-crystal appearance is achieved by special paint. Brown, green, plum and other colors are applied according to orders of customers.

Next the freshly painted cabinets go to the drying oven, a large heated enclosure wherein cabinets are fully dried in 30 minutes. Several pieces enter the ovens simultaneously. Some of the pieces go out for delivery at once, others, well wrapped in heavy craft paper, go to the warehouse for future orders.

Discussing the business end of his cabinet department, J. Steinberg asserts that the company takes no "special" orders. Die costs would outweigh any possible profit. Rather, they make from 200 to

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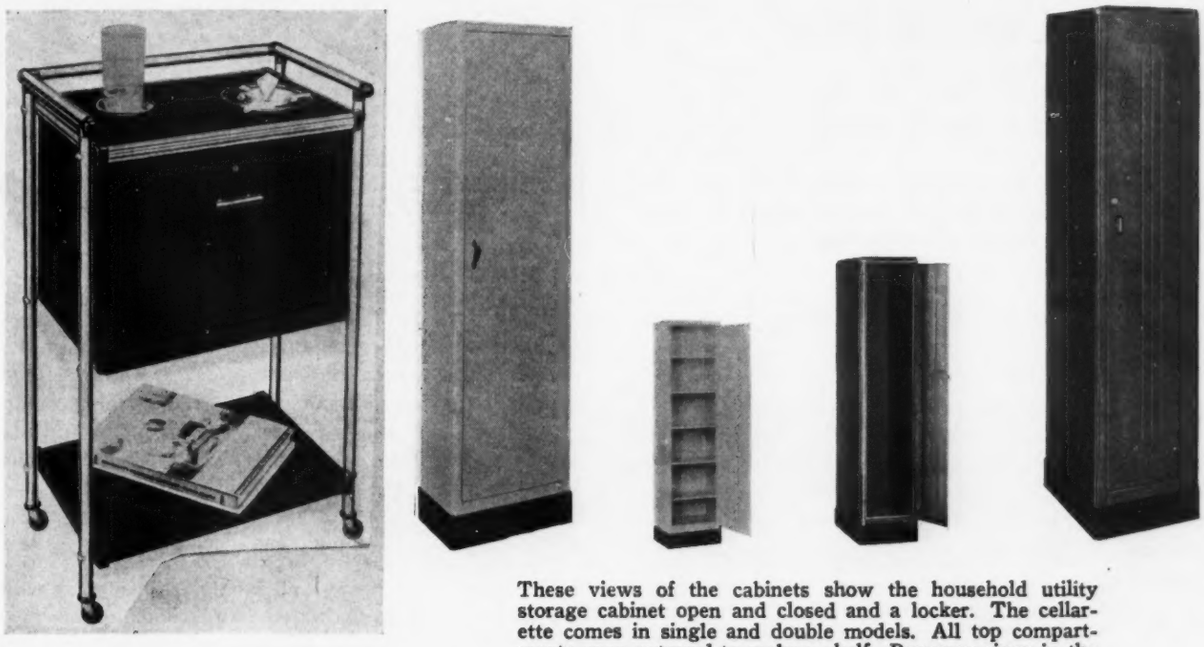
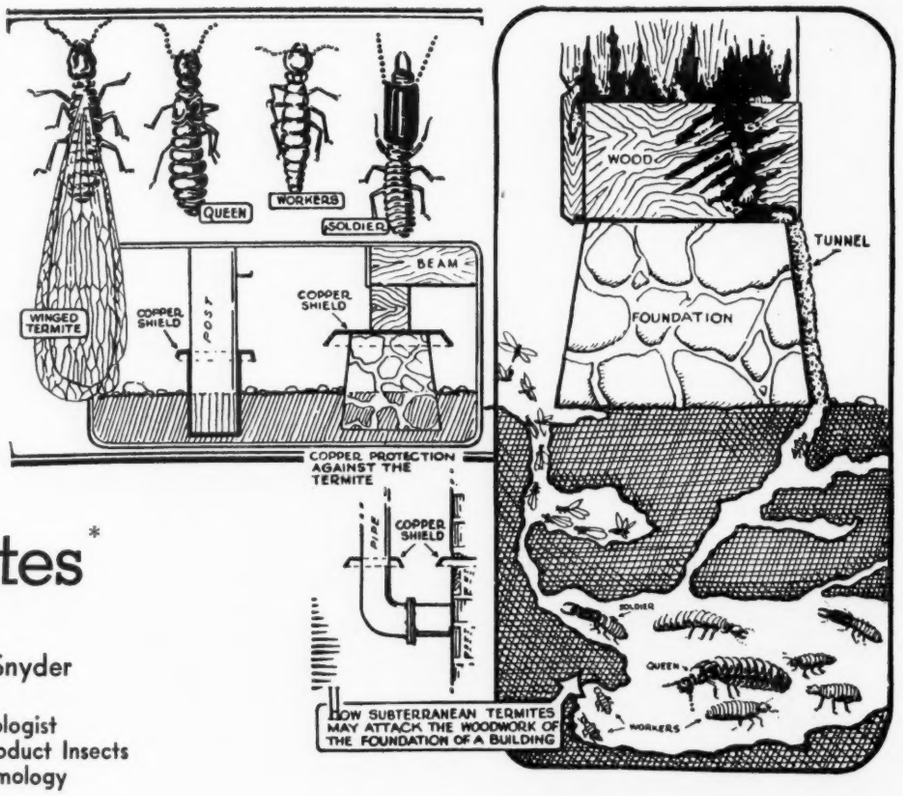


These views of the cabinets show the household utility storage cabinet open and closed and a locker. The cellarette comes in single and double models. All top compartments open outward to make a shelf. Beverage rings in the top are a feature.



The termite family is shown at the right. From subterranean chambers the insects reach wood through covered tunnels. Projecting metal shields prevent tunneling. Drawing by courtesy of Copper & Brass Research Assn.

Termites*

By Thos. E. Snyder

Senior Entomologist
Division of Stored Product Insects
Bureau of Entomology

How to Stop Termite Damage

THE means of stopping termite injury in a building are substantially the same as those to be employed in new construction to prevent the entry of termites. Inasmuch as contact with soil moisture is absolutely essential to the life of ground-inhabiting termites, reconstruction of a type which permanently breaks and makes impassable the ground connections maintained between the parent soil colony and any building will result in the prompt dying of any termites remaining in the woodwork or furniture or contents of the building even if they have reached the second or third floors. However, if through water leakage or other source such woodwork is kept more or less permanently moist, termites cut off in the building may continue to work as long as this condition lasts, and this applies particularly to damp corners of basements or similar conditions which may result from leakages of water pipes in bathrooms, kitchens, etc.

The Two Best Remedies

The most lasting and effective remedy, as already indicated, is in the replacement of wood in or near the basement of the building with concrete. Second, in order of effectiveness and durability, is in replacement of such wood with treated wood or timbers, and, in regions of excessive termite damage, to employ under both methods protective shields. By this means contact between colony and building is permanently broken and relief from termite damage is assured. This means that joists imbedded in concrete and the basement floor and baseboards should be replaced with any type of plain or ornamental concrete. In basement rooms so constructed, movable furniture of wood and also built-in furniture, particularly if resting on concrete footings, can be employed with safety.

Capping and Facing

To give the capping and facing to basement walls of frame buildings indicated in preceding paragraphs, it is rarely necessary to jack up the building, but usually it is possible to remove the upper tier of brick or upper portion of the masonry unit in sections and replace with portland-cement mortar and suitable capping of slate or mortar.

Where poor grades of mortar have been used in masonry walls below the ground, it may be necessary to coat the outside, and if necessary also the inside of the wall with portland cement or concrete to keep termites from boring through.

Metal Termite Shields

The termite shields of metal described in paragraph 4 of building instructions (Sept.), can easily be inserted over or in the masonry foundation of buildings or around pillars, supports, piping, etc., below the frame superstructure.

Soil Poisons

The possibility of stopping, for a temporary period at least, termite work in buildings by means of soil poisons placed about the foundations is in-

1. Reprint of a bulletin "Injury to Buildings by Termites." Issued by U. S. Dept. of Agriculture. This leaflet is a complete revision of, and supersedes, Leaflet No. 31.

dicated by experiments which have been under way for several years by various agencies interested in termite control. The use of such soil poisons, is, however, still very much in the experimental stage and on present information cannot be recommended as a permanent remedy. On the other hand, where termite reconstruction herein recommended is deemed by the owner to be impracticable or too expensive, the following type of soil poisoning may be used and should give temporary relief:

Soil Poison Application

The most promising of the soil poisons for such use is a full strength of crude liquid orthodichlorobenzene. This chemical should be applied in a trench two or three inches deep close to the exterior foundation walls and also along the interior of such walls as to any unexcavated areas at the rate of one gallon per 10 linear feet. Similarly it should be applied about masonry pillars supporting the main structure or porches, etc. Before making such application, all wood debris should be removed from near the wall of the building and any earth-like shelter tubes over the foundation walls, etc., should be broken off. This liquid can be obtained at a reasonable price from wholesale chemists or manufacturers of insecticides.

The cautions to be observed in the use of this chemical are not to let it come in contact with the face and hands, as it burns slightly, and it is distinctly painful if it gets into the eyes. In applying it to a closed space beneath the building, the operator should not remain too long subject to the fumes, and it is desirable to secure as good ventilation as possible while applying the chemical.

Where there is danger of orthodichlorobenzene reaching the roots of ornamental plants, etc., paradichlorobenzene in the crystalline form may be used. A shallow trench three inches deep should be dug around the foundation and the crystals placed therein to the depth of two inches and then covered with loose earth. About five pounds per 10 linear feet should suffice.

The use of these and other soil poisons is especially applicable to buildings raised on masonry pillars or partially filled-in basements or porches, but, as already indicated, such treatments lack adequate proof of effectiveness and permanency.

Caution Against Exaggerated Fears

Without desire to minimize the damage which may be occasioned to buildings and contents from termite attack, especially if long continued, it should nevertheless be pointed out that, particularly in the more temperate zones, serious termite injury to buildings is relatively infrequent and termite work may go on for years without involving necessity for extensive repairs or reconstruction of foundation timbers and flooring. Many instances could be cited of old houses dating back to colonial times where termite presence has been known for 50 years and probably for two or three times that period without radical injury resulting. Such immunity is due, in part, to the more massive timbers employed in these older types of houses, the foundation beams of which were often of large size and hewn from the mature centers of hardwood trees.

Once having invaded a building, however, termites will continue their work and extend their damage slowly or rapidly unless and until their means of entrance from the outside has been broken by effective reconstruction. With the breaking of the connection between the building and the external soil moisture, all the termites in the building promptly die and injury ceases.

Heroic Measures

While, therefore, risk of sudden collapse strictly from termite injury of any fairly well constructed building can be dismissed as very rare in the United States, the discovery of termites in a building either as indicated by swarming or by yielding flooring and timbers certainly indicates the desirability of having an examination to determine what means should be taken to stop damage. If on such examination fairly widespread injury is found, much the cheapest course in the long run is to undertake one or the other of the two types of radical replacement given the highest rating in this leaflet. The natural tendency of the home owner is, however, to attempt control by local applications or other simpler measures.

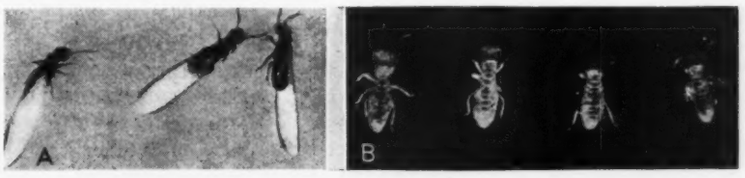


Fig. 2 — Subterranean termites: A, winged adults; B, mature workers. About 3 times natural size.

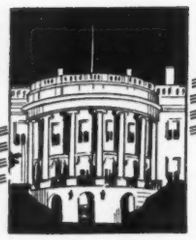
Due to the extent of the possible ramifications of termites in a building which has been infested for some little time and the protection which they have in their burrows concealed in the wood, no control worth while by fumigation or spraying has proved to be possible, and spraying, even if applied under strong pressure at borings made at occasional points in eaten timbers, is unsatisfactory. It is of interest, therefore, and informing to point out that in the case of many prominent buildings in Washington after years of effort with the various possibilities of local application of correctives, repellents, etc., together with piecemeal replacement of eaten timbers the more radical type of correction indicated has been adopted with resulting prompt and complete elimination of termites.

Not All Termites Are Wood Destroyers

In connection with the foregoing discussion, it is

(*Continued on page* 32)

Arnold Kruckman's



Washington Letter

THE next session of Congress will make a law for the further improvement of labor conditions. You will hear it called the Wage-Hours bill, the Fair Labor Standards bill, or the Black-Connery bill. They all mean the same thing.

The names of former Senator Black and former Representative Connery will inevitably be eliminated as sponsors of the bill. Black has been appointed to the Supreme Court and Connery is dead. Also, the bill to which their names were attached is dead. It was frozen to death in the Rules Committee of the House by a solid block of Southern Democrats. They opposed the minimum wage scale, the maximum week-work hour-schedule, and the totalitarian control over labor affairs which the bill vested in the Labor Standards Board.

Stalemate

It is generally understood in Washington that all of President Roosevelt's persuasiveness and popularity will not be able to pry the so-called Black-Connery bill out of the Rules Committee of the House without a damaging fight. The easier way will be for some other Senator and some other Representative to sponsor a new bill—a bill, presumably, closer to the heart's desire of the fighting Southerners, as well as to the heart of the group around FDR, who inspired and devised the bill introduced by Messrs. Black and Connery.

To understand this labor legislation, which caused such convulsions in the last session, it will be clarifying to comprehend some of the intimate background of the Black-Connery bill.

Neither Black nor Connery had anything to do with writing the bill. They were chosen to introduce it in the Congress because they were both ardent New Dealers. They actually had so little to do with making the bill that they did not fully understand its details until after they read it in printed form after it had become a Congressional document.

The bill was written by Tommy Corcoran, a brilliant young political soldier of fortune, assisted by Benny Cohen, a shy, but keen, youngish man who is one of the few survivors of the original New Deal brain-trust. The team of Corcoran and Cohen has been one of the most effective combinations in FDR's social legislation factory. Corcoran, whom Roosevelt loves for his high-spirited songs and jests, is essentially like those flashing gentlemen of satin and daring who honorably sold the service of their swords where they received the most benefits. Cohen, on the other hand, is a zealot, under cold restraint, who burns with a generous fire to make the world fair for those who are getting a raw deal.

Bill's Background

The bill itself is, like most New Deal bills, a composite of the ideas of an unnumbered stream of persons who make suggestions to FDR and his lieutenants. Of course the main source of its inspiration comes from people interested in the problems of those who work for wages.

In all likelihood one of the major influences came from the CIO. But, on the whole, it has been in the making ever since the New Deal came into power. By and large, it is a very sincere effort to improve the lot of wage-earners by giving them better pay, shorter hours, security in their jobs, and protection in their dealings with their employers.

It is one of the principal methods by which FRD hopes to give wage-earners the "more abundant life."

It is probable that the original bill was written in extreme terms with the idea that much could be sacrificed and still attain a maximum of progress in social legislation. That phrase "social legislation" is rather grandiloquently vague. It is often used in New Deal discussions. It is used here in the sense of securing permanently more privileges, ease, comforts and benefits for those who hitherto have been limited in opportunities.

The Original Idea

The whole plan turned chiefly on a uniform rate per hour as a minimum wage identical everywhere in the United States, a maximum working schedule per week uniform everywhere, and a tight control of the relations between the worker and his employer, through the agency of the National Fair Labor Standards Board.

It applied, of course, only to labor employed in interstate commerce. But that again is a term actually much more vague than it sounds. You can judge how uncertain its significance is when you realize that a Federal Court recently ruled that theoretically a business which does 99% **intrastate** business and 1% **interstate** business still could be ordered to conduct its labor practices under interstate laws. The Judge asked how may we determine whether the quantity shipped, man-power consumed, or capital involved, shall measure between intrastate and interstate commerce.

Obviously one of the most powerful effects of the law would be its prompt influence in causing State legislatures to go and do likewise.

When the bill came to hearing it was apparent that there was much difference of opinion. The A. F. of L. conducted an open campaign against it, frankly admitting that the all-embracing control of the proposed Board would practically wind-up the useful-

ness of any labor union. President Green, under White House pressure, reluctantly came out for the bill, but it was too late. Even the CIO was lukewarm.

Opposition Surprises

Industry and business was rabidly hostile, but most surprising was the bitter opposition of the South. The South maintains that its climate and other conditions make it necessary to employ from one-third to one-half more workers to perform a given task than are necessary to perform the same task in the North or West. And the South maintains that food, shelter, clothing, and practically all other goods and services cost less below the Mason and Dixon line than they do elsewhere in the United States.

The Southerners felt that the uniform wage and hours schedule would wreck their whole economic and social structure. They demanded that the differences in the rates they claimed necessary in the South be precisely specified.

But the proponents insisted that the Board itself should be allowed to work out the differentials. It was on this rock, and the rebellion growing out of the Court fight, that the Black-Connery bill finally was wrecked. What the incidental political damage may be to the New Deal, and to the Democratic party, and to the fortunes of FDR, is another story. The very active and serious effort now in progress on the part of Southern Democrats and other Democrats to bring about a coalition with the Republican remnants demonstrates how far the South has travelled away from the New Deal over this wage-hours fight.

New Bill Scope

The new bill that is to be introduced in the next session of Congress, special or regular, will fix the wage-minimum at 40c per hour, and the work-week maximum at 40 hours. That means that the lowest paid workers will receive an average of $16 per week for five days of eight hours each, or an annual wage of $800.

The wage schedule looks very modest to those employed in the trades. But it is demonstrable that the schedule, with its eight-hour, five-day work-week, spells the difference between a moderately prosperous business and complete ruin to some forms of business. Multiply these businesses by the variety of activities in the 48 States of the Union and you may be able to grasp the desperate opposition that will inevitably be waged against this feature of the bill.

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Washingto, Oct. 1, 1937.

IT has become clear during the past week that the labor legislation conflict will develop into the major issue of the next session. And it is clear that, barring the unexpected, the next session will not take place until January.

The A. F. of L., particularly the metal workers, will unquestionably exert every pressure to prevent Congress from passing the wage-hours bill as planned. Also, A. F. of L. has very definitely made up its mind that the National Labor Relations Act must be repealed.

The National Labor Relations Act is the law written by Senator Wagner which was validated, in some of its aspects, by the Supreme Court. It is administered by the National Labor Relations Board which very frankly declared that it is the function of this Government agency to protect and safeguard the interests of the worker, and that it has no mandate to give aid or comfort to the employer.

The A. F. of L. feels that the National Labor Relations Act was chiefly inspired by the CIO, and that it is administered by the National Labor Relations Board mainly in the interests of CIO. It has not helped matters that the word has gone out that Chairman Madden of the Board has informally dropped the hint here and there that the Board will oppose any amendment to the Wagner Act which will permit craft unions—A. F. of L. unions—to bargain separately with employers. The amendment is already pending in the Congress, and the A. F. of L. will assuredly press for their passage.

The A. F. of L. feels that this issue sharply affects its future existence. It feels that the continued existence of the National Labor Relations Board, as it functions under the present law, means either the dominance of the CIO, or the absorption of all union functions by the Government. Apparently A. F. of L. leaders do not feel that the time is ripe to turn the entire machinery of unionism over to the Government. There is the bitter hatred of Lewis, who is presumed to be ambitious to be either the king-maker or the king, politically; and there is Mr. Roosevelt's close association with Mr. Lewis, which is an embarrassment for FDR and yet is insoluble, at this time. The situation is full of gloom and distress for Congress—in an election year—as well as for FDR.

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The new bill which, of course, will originate in the White House, as the result of the usual accumulation of ideas and suggestions and advice, and probably will again be written by Corcoran and Cohen. Also, will provide that female children under 18, and males under 16, may work only upon the express special permission of the Government, issued through the proposed National Fair Labor Relations Board. Even overtime in any business or industry will be lawful only after the Government has given its specific permission.

Such overtime must be amply justified by some sound reason, such as an emergency, or seasonal pressure. And any employee must be paid time and one-half for all overtime.

So rigid is the purpose to protect the worker against himself, as well as against his employer, that it is proposed to require that the employer be responsible for the departure of the employee from the working premises as soon as his work is finished, under certain penalties. To make certain that the law be obeyed it will be necessary for the employer to keep a list of the employees conspicuously displayed in every workroom, or wherever they are engaged, showing their daily working schedule.

New Board Powers

The new bill, as planned, will not, it is said, modify the extraordinary powers with which the original bill invested the Board. In certain ways it is intended that the Board shall have powers to proceed to enforcement without resorting to the Courts. It will be able to inspect works and workers at all times, investigate records and, probably, interrogate customers, as well as others with whom the employer has business or other relations.

Together with the National Labor Relations Board, this Government agency will, if the bill as planned passes Congress, have about as much control over the relations of labor with industry and business as your imagination can picture. It is intended to be a complete and all-inclusive, lawful Federal control over the labor relations in interstate commerce.

It is intended that the new bill shall go further than the Black-Connery bill in that it will include regulation of trade practices. These are now regulated by the

(*Continued on page* 106)

Metal Shingles*

METAL shingles are available today in metals such as copper, zinc, terne-coated steel (roofing tin), and zinc-coated (galvanized) steel. Copper and zinc, being non-ferrous metals, require no coating to make them resist the corrosive action of the elements, and shingles made from these two metals give remarkably long service with little upkeep cost.

The initial cost of zinc and copper shingles is about four to six times that of the terne and galvanized steel shingles. Because of the lower initial cost the zinc-coated steel shingles are more commonly used. Their cost, including application, compares favorably with other types of roofing.

The durability of galvanized steel shingles depends both upon the composition and thickness of the base metal and upon the degree of protection afforded by the application of zinc and paint coatings. Copper-bearing steel shingles are recommended in humid areas, in industrial areas where coal smoke is prevalent, and on all structures near the seacoast. The inclusion of a small percentage of copper, .02 or more per cent, in the base-metal retards to a considerable degree the rate of rusting. Rusting is best prevented, however, by protecting the iron or steel with a zinc coating. The protection or rust-free service afforded by the zinc coating depends largely upon the weight or thickness of and the uniformity with which the zinc is applied. The greater the weight or thickness, the longer the coating will wear. Steel shingles that are hand dipped in a galvanizing bath are preferred to sheets cut and formed from tight galvanized iron or steel.

Metal shingles in various patterns may be used

Reprinted from Extension Engineering Series No. 62 of Massachusetts State College, U. S. Dept. of Agriculture, by W. C. Harrington, Extension Agricultural Engineer.

APPROXIMATE COST OF 100 SQ. FT. (1 SQUARE) OF 14-OZ. COPPER SHINGLE ROOFING

(Weight, 125 lbs. per square. Estimated life, 50 years)

1 sq. 30 lb. waterproofed felt	$4.00	$1.00
½ lb. nails	.20	.10
⅛ hr. labor, carpenter	1.00	.13
⅛ hr. labor, helper	.50	.07
Compensation insurance	10%	.02
1 sq. 14-oz. 8"x12" shingles	22.00	22.00
3 lbs. copper nails	.20	.60
2 hrs. labor, carpenter	1.00	2.00
Compensation insurance	10%	.20
Total Cost Per Square*		$26.12
Annual Cost Per Sq. Without Interest		.52

APPROXIMATE COST OF 100 SQ. FT. GALVANIZED STEEL SHINGLE ROOFING

(Weight, 120 lbs. per square, No. 26 gauge. Estimated life, 15 years without painting)

1 sq. 15-lb. waterproofed felt	$2.00	$0.50
½ lb. nails and caps	.10	.05
⅛ hr. labor, carpenter	1.00	.13
⅛ hr. labor, helper	.50	.07
Compensation insurance	10%	.02
1 square roofing shingles	6.10	6.10
3 lbs. galvanized shingle nails	.10	.30
1 hr. labor, carpenter	1.00	1.00
Compensation insurance	10%	.10
Total Cost Per Square*		$8.27
Annual Cost Per Sq. Without Interest		.55

*The above estimates are for plain roofs and do not include flashings, ridge roll, eave or gable end strips.

To the above estimates must be added freight, cartage, handling charges, sales expenses, and profit.

on buildings having a roof slope of 6 inches or more rise to 12 inches run, commonly known as one-quarter pitch. There are three standard sizes: 7″x10″, 10″x14″, and 14″x20″.

Light Weight Advantages

As metal shingles are light they do not require heavy roof framing. They are so constructed that all nails and nail holes are covered and protected, and the expansion and contraction of the metal is taken care of in the seams. Metal shingles applied according to manufacturer's recommendations will withstand exceptionally severe wind storms. It is advisable to apply metal shingles to solid wood roof decking, which should be covered with a 15-pound asphalt-saturated felt, red rosin-sized sheathing paper or any building paper not containing coal tar. This paper, together with a solid or tight wood deck, acts as an insulating material, helping to reduce the heat loss of the building during the cold months and to lessen the absorption of heat during the summer. Its use lessens the air infiltration and also tends to prevent the condensation of moisture on the under side of the shingles.

Above—House in Cincinnati, Ohio, covered with "Ohio" Metal Shingles. Below—Barn in Cliquot, Minn., covered with high relief shingles.

Importance of Painting

Metal shingles made from terne-plate are customarily furnished painted red on both sides; they are dipped at the factory and must be painted again at regular intervals, as the metal depends principally on the point for its protection from the elements. The same painting intervals are suggested as for old-style tin roofs and which have been in use for over half a century.

Weather Protection

Galvanized shingles will last indefinitely if kept well painted. All concealed surfaces and the under side of flashings, valleys, ridge roll, and other trim should be painted with a coating of red lead or other metallic paint and allowed to dry before being applied. Shingles made from galvanized steel can be painted immediately after being applied if the coating has been treated with diluted acetic acid or white table vinegar, otherwise the shingles can remain unpainted until the weather has prepared the surface for the adherence of paint. This should be done before the zinc coating has worn thin and before any rust spots appear. The paints recommended for the priming coat are red lead and linseed oil. This may be followed by Venetian red, iron oxide, white lead, zinc, or other metallic paints. Asphalt paints, although commonly used, tend to absorb heat. Tar paints, which often contain injurious acids, are recommended only when pure. Paint coats should be applied at intervals not exceeding five years to form an effective protective coating.

Reroofing

For re-roofing, 1½″ nails are recommended; over wood shingles, 1¾″ nails; and for application direct to roof decking, 1″ nails. Galvanized nails should be used with galvanized steel roofing, copper nails with copper, and zinc nails with zinc.

The weight per square of metal shingles ranges from about 90 pounds in the terne-coated steel to about 120 pounds for the galvanized steel. Only 64 of the 14″x20″ size are required to cover 100 square feet of roof area and from 136 to 150 of the 10″x14″ size.

Fireproof Construction

Metal shingles are fireproof and when properly grounded they are lightning-proof. They do not dry out, rot, curl, tear, or split, and if kept painted they retain their appearance throughout their entire life. Ridge rolls, finials, hip and eave starters, all flashings, gutters and down-spouts, and nails should be of the same material as the shingles to prevent corrosion. It is often advisable, however, to use heavier gauges for flashings and valleys. All metal roofs, including flashings, cupolas, and down-spouts, should be properly grounded to conform with the Underwriters' Code for Lightning Protection.

Bowling Alley Ventilation

By R. F. Jeske

Milwaukee, Wisc.

THIS article explains a ventilating system for a tavern and bowling alleys, located in the basement of a building and entirely below grade or street level. There are no windows or doors in this room except one pair of entrance doors leading from entrance arcade to this basement room; nor is there any way of exhausting through ceiling, as there is a store above at first floor level and offices in the second story.

Old System Failed

At the time this building was erected, there was built in a vertical flue, 45x12 inches shown on plan from basement to roof above second story, terminating above roof in a sheet metal penthouse in which was placed a propeller type of fan. In addition, there were provided and built into the walls four vent flues with 12x15 inch register faces. One of these located in East wall of tap room (or bar room) section and the other three were located at rear of East end of bowling alleys where pin setting up machines are located. The four flues at rear or East wall did not extend to roof, but terminated through the wall to the outside about six feet above grade with protective screens at outside.

It was expected that this arrangement would ventilate this basement. Needless to say, it was a grand failure, due to the following reasons. Any fan, blower or exhaust apparatus will draw incoming air from the place of least resistance. The entire length of bowling alleys is about 100 ft. from front to rear wall with the front ten to twelve feet having seats for spectators and here most of the smoke is created. It cannot be expected that the propeller fan located at top of vertical vent flue, will draw air from the four vent flues in rear east wall, but will instead draw all air from the pair of entrance doors shown on plan, taking a path from the doors to vent flue and thus ventilating only the front corner of the basement, which contains only lockers and no people. Result: the old system was not ventilating the main basement section.

New System as Per Plan

To overcome this, a new system was installed as illustrated. We must remember that all smoke and foul air is created at tap or bar room section and at the spectators section, which extends into the bowling area about ten to twelve feet from front wall and from South wall the entire width of alleys to the tap room section, or about fifty-three feet. By running a duct at ceiling as shown, which tapers the entire length and providing intake openings with grills at regular intervals (15 in number), suction is created where smoke is heaviest and incoming air from front doors and the one vent flue in East wall of tap room is drawn over the area having the greatest contamination and then into the fifteen inlets into main exhaust duct. While a little air may be drawn in through the three flues located in East or rear wall of bowling alleys, this is not considered a factor and was not taken into calculations.

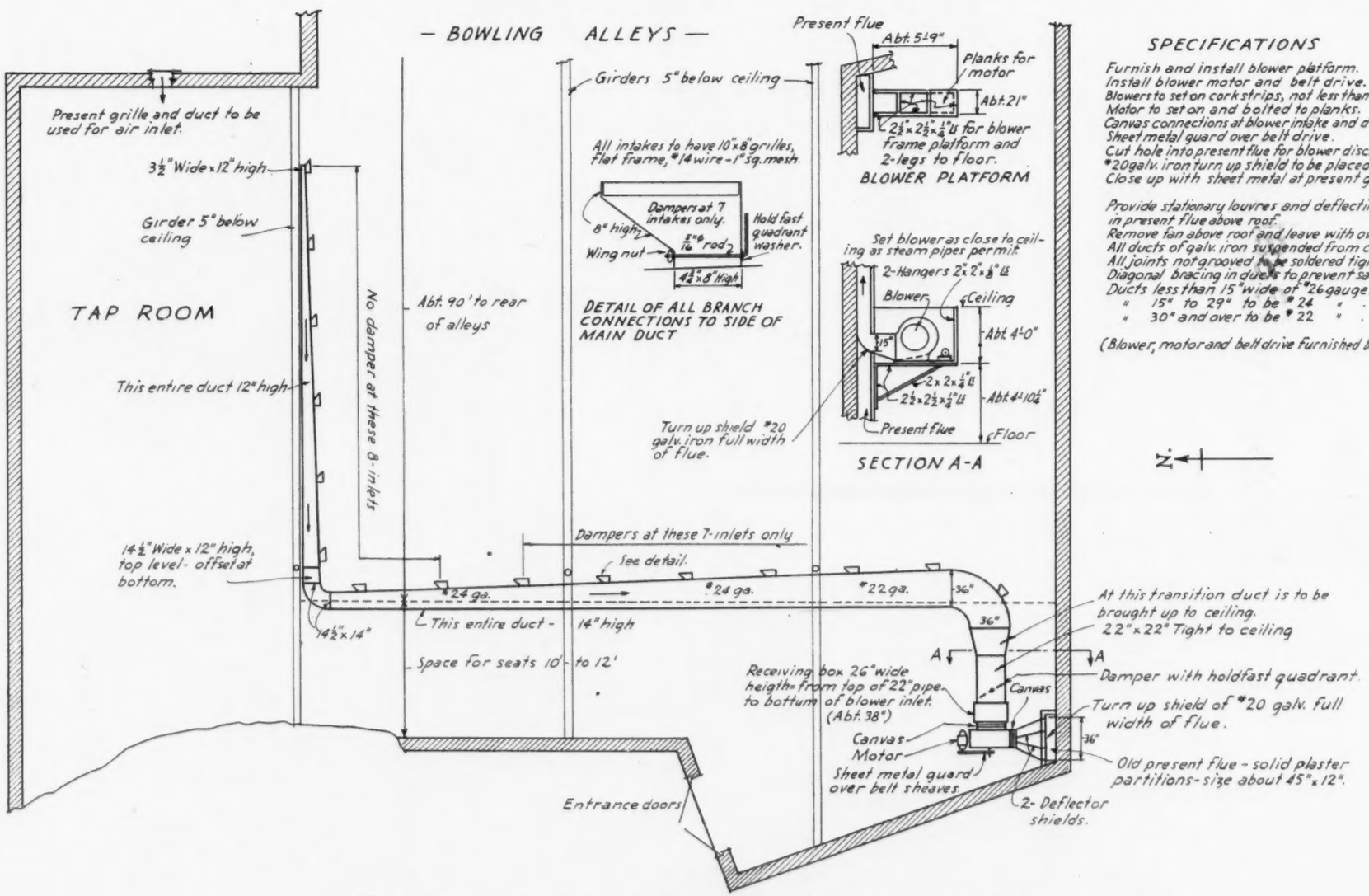
Air Requirements

In the air change calculations, it was not necessary to consider the rear portion of bowling alley section, as there are no people there except the "pin boys" and they will receive sufficient ventilation from the little air that comes in through the three rear vent flues. Therefore, calculations were based on a space seventy-five feet wide which covers combined width of alleys and tap room space, being entire space from South to North walls and fifty feet in depth or the entire space from front or West wall to end of tap room section or East wall. We thus have a space 75x50x9 ft. high, containing 33,750 cu. ft. Dividing this by a six minute air change we arrive at 5,620 cfm, which is ample. Or we may ventilate only the tap room section of 20x50 ft. and the spectators section of about 15x55 ft. which together will amount to 16,425 cu. ft. This method of calculation will answer the purpose, but we must then use a three minute air change for this smaller area, which is really the heavily contaminated area and will then arrive at 5,480 cfm which is about the same amount of air as per previous calculation. A blower was installed delivering 5,500 cfm.

Air Velocities

The basement not being very high and aiming at ducts as small as possible for appearance sake and to not reduce head-room above the seats, which are elevated above the regular floor, rather high velocities were used. In the main duct 1,600 fpm; in branch inlets into main duct also 1,600 fpm and at grilles 900 fpm. This high velocity at grilles is not too much, as they are well above the heads of occupants.

This system is in operation and performing very satisfactory and a one H.P. motor at 1,750 rpm is used.


3-Present ducts in wall at rear of alleys (not shown) to remain for air inlets.
— BOWLING ALLEYS —
Present grille and duct to be used for air inlet.
3½" Wide x 12" high
Girder 5" below ceiling
TAP ROOM
This entire duct 12" high
No damper at these 8-inlets
Abt. 90' to rear of alleys
14½" Wide x 12" high, top level - offset at bottom.
14½" x 14"
Girders 5" below ceiling
All intakes to have 10"x8" grilles, flat frame, #14 wire - 1" sq. mesh.
Dampers at 7 intakes only.
8" high
Wing nut
⅝" rod
Hold fast quadrant washer.
4½" x 8" High
DETAIL OF ALL BRANCH CONNECTIONS TO SIDE OF MAIN DUCT
Present flue
Abt. 5'-9"
Planks for motor
Abt. 21"
2½" x 2½" x ¼" L's for blower frame platform and 2-legs to floor.
BLOWER PLATFORM
Set blower as close to ceiling as steam pipes permit
2-Hangers 2" x 2" x ⅛" L's
Blower
Ceiling
Abt. 4'-0"
15"
2 x 2 x ¼" L's
2½ x 2½ x ¼" L's
Abt. 4'-10½"
Present flue
Floor
SECTION A-A
Turn up shield #20 galv. iron full width of flue.
Dampers at these 7-inlets only
See detail.
#24 ga.
#24 ga.
#22 ga.
36"
36"
This entire duct - 14" high
Space for seats 10' - to 12'
Receiving box 26" wide height from top of 22" pipe to bottom of blower inlet. (Abt. 38")
A
A
Canvas
Canvas
Motor
Sheet metal guard over belt sheaves.
36"
Entrance doors
2- Deflector shields.
At this transition duct is to be brought up to ceiling.
22" x 22" Tight to ceiling
Damper with holdfast quadrant.
Turn up shield of #20 galv. full width of flue.
Old present flue - solid plaster partitions - size about 45" x 12".
SPECIFICATIONS
Furnish and install blower platform.
Install blower motor and belt drive.
Blowers to set on cork strips, not less than ¾" thick.
Motor to set on and bolted to planks.
Canvas connections at blower intake and discharge.
Sheet metal guard over belt drive.
Cut hole into present flue for blower discharge.
#20 galv. iron turn up shield to be placed in flue.
Close up with sheet metal at present grille.
Provide stationary louvres and deflecting shield in present flue above roof.
Remove fan above roof and leave with owner.
All ducts of galv. iron suspended from ceiling.
All joints not grooved to be soldered tight.
Diagonal bracing in ducts to prevent sagging.
Ducts less than 15" wide of #26 gauge.
" 15" to 29" to be #24 " .
" 30" and over to be #22 " .
(Blower, motor and belt drive furnished by others)
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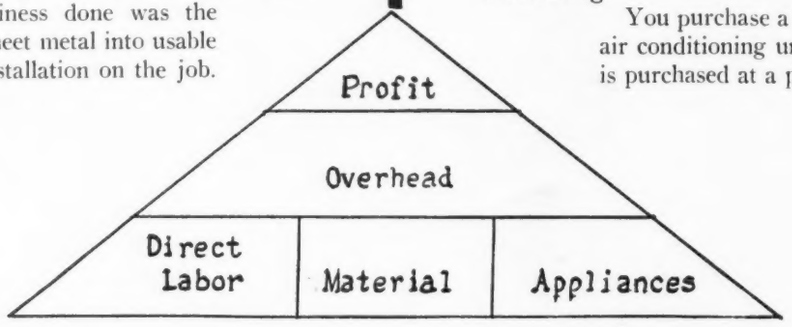
EXHAUST SYSTEM FOR BASEMENT TAVERN & BOWLING ALLEY

Are Your Sales Properly Classified?

By Joseph G. Dingle
C. P. A., Ottawa, Ill.

IN our last article we asked if you had a good set of books. We stated several of the requirements of such records and asked you to rate your present system of bookkeeping. We sincerely hope you did this, because even though you have a "good" set of books, the changing times makes it vitally essential that your books be kept up to date.

In the ARTISAN of July 5, 1930, we published a "Chart of Accounts" which we felt at that time provided suitable accounts for the average sheet metal shop. In that chart we provided only two sales accounts, one for labor and one for materials. At that time, those two classifications seemed adequate for the average shop because by far the greater percentage of business done was the fabrication of sheet metal into usable form and its installation on the job.



Today, however, we find things quite different. The modern furnace is a more complete factory job, with blowers, air filters or washers and fittings, automatic controls, and using either gas, oil, or coal, and quite frequently the coal is stoker-fed. These newer and more complex devices can hardly be called "materials," in the sense of that term as used seven or eight years ago. Materials are still being used, but, in addition, we should have a sales account for "Appliances," in which to record the sales value of these appliances, also a "Cost of Sales—Appliances," in which to record the cost of the appliances sold.

Sales of Appliances

Let us here discuss the reasons for segregation of Sales of Materials and Sales of Appliances. "Materials" include sheet metal, angle iron, and general raw material used by the shop in the fabrication of usuable merchandise. "Appliances" should include only finished units purchased and sold as such. For instance, a modern furnace which you buy complete, with jacket, should be an "appliance." The air conditioning unit is an "appliance." When you sell a furnace job with air conditioning, your sales of "appliances" would be the furnace and air conditioning unit. Your sales of "materials" would cover such air ducts, fittings, registers, etc., used in installing the appliances, and, of course, sales of labor would be the direct labor of installation and fabricating.

You purchase a complete furnace, with the air conditioning unit. This appliance usually is purchased at a published price from which you are allowed a "dealer's discount." You must be content, then, to sell this appliance at the advertised list price and there is a fixed gross profit for you. You are powerless to increase your mark-up, and on the other hand you may feel you can afford to cut the price.

On this point, you should always remember that the manufacturer who fixes a selling price on his product wants to sell as many units as possible, therefore, fixes his price as low as he can. He allows the dealer a margin of profit sufficiently large to permit him to make a little money if he maintains average sales volume, with average overhead costs. The wise dealer knows he can not afford to cut prices.

On the other hand, materials are purchased without published prices, and must be converted into usable form for sale. This conversion involves the use of shop equipment and facilities, and the mark-up should be sufficient to include a reasonable al-

lowance for the use, operation, and wear and tear, of the shop equipment.

These two sales departments, Materials and Appliances, differ quite extensively in your control of your selling price, also in your cost. Appliances are purchased as finished units, and sold as such, usually in connection with Sales of Labor and Sales of Material, as an installed and ready to operate unit. By merging Appliances and Materials you are unable to quickly and accurately ascertain your gross profit on the appliances and your gross profit on the materials. Your gross profit on appliances sold should be equal to your "dealer's discount" and if it be less you can readily detect price cutting.

On the other hand, your gross profit on materials sold should be more or less of your own making and should be, as stated above, sufficiently high to absorb shop overhead incidental to the use and operation of the equipment used in fabricating the raw material into usable objects. A well equipped shop will fabricate materials with less direct labor cost than a poorly equipped shop, but this equipment costs money and its depreciation, repair and operating expense must be loaded against the cost of the fabricated materials. By the use of these two sales accounts, you segregate your business into natural classifications, each having different elements of cost, and are thereby better able to watch gross profits.

Sales of Labor

Sales of Labor, of course, should be a separate account and as your Cost of Sales of Labor you would have your productive, or direct, labor. Don't overlook the fact that while your pay roll in the past has been your true cost for accounting and cost finding purposes, that is not the case today. Since the Social Security Act became effective we have new taxes based upon pay rolls, and for 1937 these taxes amount to 3 per cent. In 1938 and 1939, they will be 4 per cent, and thereafter, unless the law is changed will increase one-half of 1 per cent every three years until the maximum of 6 per cent is reached. This new tax burden is such that unless included in your costs and recovered in your selling price, it will eat up a substantial part of your profit.

Right here, let us call attention to the fact that it is unlawful for an employer to state publicly that he has had to increase his prices because of Social Security taxes, unless he can prove that his price increase is not more than his actual tax. And, incidentally, such proof is quite difficult.

As a general rule, your work will include a sale of a completed installation, including appliances, materials, and labor. In making up your estimate you will, of course, price the three elements separately, so you can easily break the sale into its several parts.

In fabricating your materials, and installing the appliance and fabricated parts, your cost records can easily segregate these costs, and upon completion of the job, the job costs may be charged to the three cost of sales accounts. Also in preparing operating statements, your sales will be properly segregated into Sales of Appliances, Sales of Materials, and Sales of Labor, and for each sales account you will have a "Cost of Sales" account, and thus be able to judge the operating efficiency of your business in each of the three major departments.

Again, it might be that you have a franchise covering a product in your territory, and as a result of such franchise you may do some jobbing business. In this case, it is a wise plan to recognize the unusual condition, and have a fourth sales department—Jobbing Sales of Appliances. Such sales will, of course, carry only a jobber's profit, and if merged with your Sales of Appliances, which are sales in which you make a full dealer's profit, the net result will be to bring down your gross profit. Your use of separate sales accounts will show the results obtained for each class, and, while your jobbing sales will show only a small gross profit, as compared to your regular sales, you will understand the cause of such difference and not be misled.

Watch the Gross Profit

Too often a shop owner finds his total sales volume quite satisfactory, yet without a satisfactory gross profit, and, unless his sales have been segregated into their natural classes, there is little opportunity for him to isolate the cause of low gross profits. Note carefully we are discussing GROSS PROFIT, not NET PROFIT. As we have repeatedly said, gross profit is beyond your control. Your wholesaler or manufacturer fixes your buying price and either the manufacturer or your competitor, or both, fix your selling price. It is, then, your problem to see to it that your gross profit for each department is as high as it is supposed to be. Should you discover, for instance, that with dealer's discount of 25 per cent from retail list, your gross profit is less, you will find you have been cutting prices. While it is true it requires a mark-up of 33⅓ per cent to yield a gross profit of 25 per cent, a dealer's discount of 25 per cent yields a 25 per cent gross profit. To illustrate:

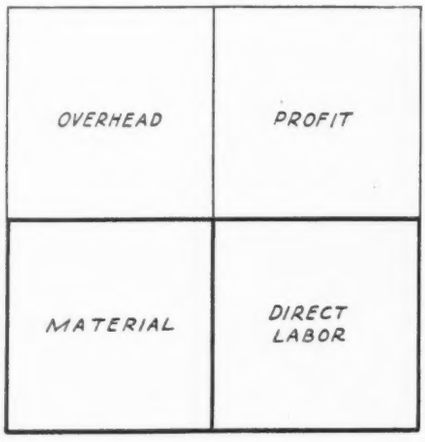
List price	$100.00
Dealer's discount of 25 per cent..	25.00
Your cost	$ 75.00

To sell at $100.00 you must add $25.00 to your cost of $75.00, or 33⅓ per cent. With a selling price of $100.00 and a cost of $75.00, your gross profit is $25.00, or 25 per cent of your selling price.

The old saying that "if you will take care of the pennies, the dollars will take care of themselves" may be applied to your gross profit in each natural sales classification. If you take care of your gross profit the net profit will be better able to take care of itself. Of course, you must watch that profit-eater, overhead, every minute, or your gross profit will be badly damaged.

After you have segregated your sales into the natural classifications we want you to carefully consider your overhead. The present tax burden has materially increased overhead, and we urge that our readers seriously study the overhead, item by item, and be prepared to increase, where possible, the mark-up, and if such mark-up is impossible, see that some step is taken to compenaste for this extra burden. Some expense may be reduced; or possibly some new sales program may increase volume without increasing overhead. Increased Sales Volume is always the best way to reduce overhead, provided, of course, such increased sales are made without sacrifice of gross profit.

We think it a good idea to give you here our present day conception of the customer's dollar. Several years ago, we used a design like this:



Those were the old days, and today we think the customer's dollar has a different appearance. Many things have brought changes for each business, operations are on a different basis, and to survive, the business man must know and understand his own business, and at more frequent intervals than the calendar year.

How Profit Is Made

Our new design shows overhead laid upon Direct Labor, Material and Appliances, and as a crown, profit—small, but there, as the crowning point of the design. We like this design, and by turning it upside down, the few pennies of profit may be squeezed out of business by the pressure of the cost of the sales of labor, material and appliances. As these elements trickle down through overhead, profit is realized. Again, in its inverted position, we can readily see that as volume decreases, so should overhead decrease, and if this be not true, there will be no profit.

We suggest that you carefully consider the suggestion made above regarding the proper segregation of your sales into their natural classes or groups. Then write us giving your views on this problem in order that we may best serve the industry. We expect to have in the November and December issues sufficient data to enable our readers to revamp their bookkeeping methods at January 1st next. It is our firm belief that the business revolution we have come through has made it vitally necessary that the business man of today keep his records in such shape as to instantly provide usable data. Will you cooperate with us in presenting suggestions to your fellow business men?

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Termites

(*Continued from page 23*)

well to point out that in certain areas, particularly in the Southwestern States, there occur types of termites which never feed upon, nor can they digest, sound wood and hence never attack such wood in buildings or elsewhere. These types feed on low vegetation—grasses, etc.—the stems of which they cover with earthlike tubes and the resulting partially decayed vegetable material is the only food on which they can subsist. The presence of the earthlike tubes of these termites near or even under houses, or the presence of the winged forms may be wrongly interpreted as indicating liability of invasion by one of the wood-eating termites, and therefore the house owner should make sure that any agency professing to give termite control is able to distinguish between this form and the destructive type of termites. Before authorizing control measures involving what may prove to be quite unnecessary outlays, the owner, if in doubt, should consult his State entomologist or send specimens for identification to the United States Bureau of Entomology, Washington, D. C.

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50,000 Cabinets

(*Continued from page 21*)

1,000 pieces at a time in the same model. This saves frequent die changing—an operation that requires from 30 minutes to one hour—and keeps overhead low. No special orders are put into work procedure unless 500 duplicates are in the order. Attention is centered on bulk manufacture.

During the 35 years that general sheet metal work constituted the sole business of J. Steinberg & Sons, a large clientele was accumulated. Repeat orders from these old customers continue to bring considerable such work into this plant. As Irving has charge of the Artline Metal Products department, L. J. Steinberg, a brother, has assumed control of the general sheet metal contracting end of the activities of the company which still are substantial. Restored building construction should increase this department considerably, but as matters stand today cabinet fabrication is the chief dependency to keep things humming. From the gross yearly cabinet production of 50,000, or about 1,000 weekly, it is evident that this is one of the real active shops of the state of New Jersey.

The Fort Wayne Licensing Ordinance

In the June, July, August and September issues we published those parts of the Fort Wayne Code dealing with definitions of terms, the regulations for the Inspector, Examining Board, Permits; Minimum Requirements for Estimating Losses, Chimney Sizes, and Gravity Warm Air Heating. This issue covers Mechanical Warm Air Heating and Air Conditioning.

Mechanical Warm Air Heating and Air Conditioning

Section 27. Amount of Air to be Circulated, How Determined: The amount of air to be provided for each room or space to be heated or conditioned shall not be less than that determined in the following manner:

(a) Calculate the heat loss from each room to be heated, in B. T. U. per hour, of this ordinance: add ten (10) per cent for factor of safety.

(b) Assume an average temperature in the warm air supply ducts and also in the cold air return ducts. These temperatures are usually assumed to be 135 degrees Fahrenheit for the warm air and 65 degrees Fahrenheit for cold air. The difference between these two values is the temperature drop.

(c) Calculate the weight of air to be circulated to each room, using the formula:

$$W = \frac{H1}{0.24 \times Td}$$

Where
W—Weight of air to be circulated in pounds per hour.
H1—Total calculated heat loss in B. T. U. per hour, plus ten (10) per cent safety factor.
0.24—Specific heat of air.
Td—Temperature drop.

(d) Obtain volume of air, in cubic feet per minute (q), for warm air and cold air, as follows:

$$q = \frac{W}{60d}$$

where "q"—volume of air in cubic feet per minute.
d—density of air in pounds per cubic foot at assumed average warm air or cold air temperature and standard barometric pressure (29.92 inches of mercury).
60—Conversion factor from hours to minutes.
Values of d may be obtained from any standard tables on properties of air.

How Determined: Ducts may be either round of rectangular. Rectangular ducts should be as nearly square as possible; the width should where possible not be greater than 4 times the depth. The radii of elbows should where possible be not less than the pipe diameter, for round pipes, or the equivalent round pipe size in the case of rectangular ducts. Provided, however, that in old buildings where strict compliance with foregoing provisions in regard to elbows would be impracticable, special permission may be granted by the Inspector of Buildings for deviations from such provisions.

The ducts or piping may be designed either as a trunk line system or as a system of individual ducts from the heating unit to each register. Individual ducts may be grouped to simulate a trunk duct system in appearance.

In the design of any duct system, the following procedure shall be adhered to in determining the sizes of the various ducts throughout the system:

(a) Study the plan of the building and draw in roughly the most convenient system of ducts, taking cognizance of the building construction, avoiding all obstructions in steel work and equipment, and at the same time maintaining a simple design.

(b) Arrange the positions of duct outlets to insure the proper distribution of heat.

(c) Divide the building into zones and proportion the volume of air necessary to supply the heat for each zone.

(d) Determine the size of each outlet, based on the volume as obtained in the preceding paragraph, for the proper outlet velocity.

(e) Calculate the sizes of all main and branch ducts by either of the following two methods:

a. Velocity Method: Arbitrarily fix the velocity in the various sections, reducing the velocity from the point of leaving the fan to the point of discharge to the room. In this case the pressure loss of each section of the duct is calculated separately and the total loss is found by adding together the losses of the various sections.

b. Friction Pressure Loss Method: Proportion the duct for equal friction pressure loss per foot of length.

c. Total Resistance, How Determined: Calculate the friction of the duct, both supply and return, which offers the greatest resistance to the flow of air. This shall include the resistance of all elbows or other fittings, registers and air inlet. Add to this resistance of filters, air washer, furnace or other devices located in the air stream. The result, plus a reasonable factor of safety, will be the total resistance of the system, which shall be used in the selection of the fan or blower.

Friction losses for ducts and fittings shall be determined in accordance with the best engineering practices. Resistance of furnace, filters, air washers, cooling coils and other devices shall be taken from the various manufacturers' ratings certified as to correctness.

d. Maximum, Allowable Velocities: The air velocities in feet per minute, given in the following table shall not be exceeded in the various types of installations to which they apply:

Classification of Systems by Velocities Through Ducts and Registers

DESCRIPTION—	Low Velocity System	Medium Velocity System	High Velocity System
Main ducts	500	750	1,000
Branch ducts	450	600	750
Wall stacks	350	500	600
Baseboard registers	300	350	400
Wall registers above breathing line	500	550	600

The low and medium velocity systems shall each apply to residential work. The medium and high velocity systems shall apply to public building and commercial installations.

For industrial or other buildings where noise is not objectionable, higher velocities may be used where conditions permit and duct work is so designed, subject to the approval of the Inspector of Buildings.

Velocities through air washers shall not exceed 600 f.p.m., or the maximum velocity recommended by the manufacturer in his published data.

Velocities through furnaces and cooling coils of the various types shall not exceed those recommended by the manufacturer in his published data.

Velocities through air filters of all types shall not exceed those recommended by the manufacturer in his published data.

e. Dampers: In an individual duct system, each duct shall be provided with a volume damper with substantial mounting and positive locking device.

In a trunk system, each branch duct shall be provided with a volume damper. All dampers shall be provided with positive locking devices.

Wherever studding space is used to convey return air to blowers, such space shall be blocked off with metal or fuseable-link fire stops installed immediately above base board registers or at the floor where floor registers are used.

f. Supply Air Registers: All supply registers shall be securely fastened to connecting pipe and shall be effectively sealed against leakage around the borders or margins to prevent streaking of walls. The free area of all supply registers shall be such that the air velocity through the free openings will not exceed that provided in Sub-section 28-d of this ordinance.

g. Return Air Registers: Return air registers shall be made of metal or wood. The free area shall be at least equal to the free area of the duct or ducts to which they are connected.

h. Construction of Ducts: In connection with a mechanical warm air heating or air conditioning system, the construction of all sheet metal duct work hereafter installed shall be in accordance with the following provisions:

Sheet Metal Gauges and Seams for Rectangular Duct Construction

U. S. Standard Gauge	Width of Duct in Inches	Seam in Inches	Reinforced Seam in Inches
26	to 12	...	.....
24	13 to 30	1	.....
22	31 to 48	1	.....
20	49 to 60	1½	⅛x1⅜
20	61 to 90	1½	⅛x1⅜

The above gauges shall apply for circular ducts of diameters corresponding to given widths.

Provided, however, that for residential work not lighter than No. 30 U. S. Standard gauge may be used for ducts not exceeding 4½"x14", No. 28 gauge for ducts not exceeding 12 inches greatest dimension, No. 26 gauge for ducts not exceeding 30 inches greatest dimension, No. 24 gauge for larger sizes.

No duct smaller than four (4) inches in diameter, or corresponding area for rectangular duct of equal friction loss shall be installed.

Ducts having a greatest dimension of more than 24 inches shall have transverse exterior braces spaced not more than 48 inches on centers. Where "S" cleats and drive cleats are used to connect ducts, formed angle cleats may be used in lieu of stiffener angles.

Elbows shall be provided with splitters or diffuser vanes where necessary to maintain uniform velocities throughout duct area and reduce turbulence and impact losses. Transformation fittings shall be made with gradual slopes. Where a pipe or other obstruction passes through a duct a streamlined sheet metal sleeve shall be installed around such obstruction and shall be soldered to duct at ends to make airtight. The area of the duct, at point of such obstruction, shall be increased by an amount equal to the area of the streamlined sleeve.

The same general provisions, with the exception of standing seams, shall apply to circular ducts, which shall be lapped not less than one and one-half (1½) inches. Such joints shall be match-beaded, or beaded and soldered, welded, screwed or riveted. No solid joint is required where round duct slips over the casing collar or enters boot or box.

All duct work shall be properly secured to ceiling or joists or supported by substantial brackets when run along walls.

Section 29-a. Size of Furnace: Add together the heat losses, expressed in B. T. U., of the various rooms in the building, and for continuously heated buildings, add to this sum twenty-five (25) per cent of such heat losses as a factor of safety. For intermittently heated buildings, add from fifty (50) to one hundred fifty (150) per cent as such safety factor, depending upon the heat capacity of the construction material, the higher percentage applying to materials of high heat capacity such as concrete and brick. The resulting sum shall be taken as the total heat loss of the building upon which the selection of the furnace shall be based.

In the selection of a furnace to be installed in connection with any mechanical warm air heating or air conditioning plant, the following formulae shall be used in determining the size or capacity of the furnace, employing for said purpose that one of said formulae which is applicable to the kind of fuel which is to be used.

b. Solid Fuel Burning Furnaces: The following formula shall be used to compute the heating capacity or output of the furnace in B. T. U. per hour:

$$G = \frac{H}{F \times C \times E}$$

where

G—grate area, square feet.

H—heating capacity or output at registers, B. T. U. per hour.

F—calorific value of fuel, B. T. U. per pound, which shall be taken as 12,790.

C—combustion rate in pounds of fuel per square foot of grate per hour which shall be taken as 7.5.

E—furnace efficiency based on heat available at register faces which shall be taken as not more than 63 per cent for gravity installations; for mechanical installations, as per manufacturers ratings.

The above formula allows 420 B. T. U. per square inch of grate area for a furnace having a ratio of heating surface area to grate area of 20 to 1. For furnaces having other ratios of heating surface area to grate area, add two (2) per cent for each unit by which such ratio exceeds 20 to 1 and deduct two (2) per cent for each unit by which it is less than 20 to 1.

Definition: The heating surface area is hereby defined as all surfaces of the furnace body inside the casing, above the grate level, in contact with fire, flame or hot gasses on one side, and circulating air on the other side, and the surface area of the air side of such portion of the furnace body shall for the purposes of this ordinance, be considered the heating surface area of the furnace.

c. Oil Burning Furnaces, Conversion Type: Where an oil burner is to be installed in a furnace not especially designed for the exclusive use of oil as a fuel such furnace shall be selected as provided in Section 29-a and Sub-Section 29-b of this ordinance as for solid fuel burning furnaces and with the additional requirements that the heating surface to grate area ratio of such furnace shall be not less than 20 to 1. Where such ratio is less than 20 to 1, the next larger size furnace shall be used. No oil burner shall be installed in any used warm air furnace until the same has been re-set and made leak proof.

d. Oil Burning Furnaces, Unit Type: Where a furnace is specifically designed for the use of oil fuel only and has an oil burner designed for adaptation to that particular type

(*Continued on page* 101)

VOTE

RESIDENTIAL AIR CONDITIONING SECTION

IN this month's section we publish the first article in a series intended to point out how air conditioning has progressed in agriculture and what is likely to be the future of this very broad field.

- - - Did you know, for instance, that air conditioning (year round) has already been found *profitable* for preventing the death of young livestock? That chickens will grow faster, fatter and lay better in conditioned buildings? That seed grain can be dried quicker and more uniformly under controlled heat and humidity? That fruit can be held until the market prices rise if the fruit is cooled and humidified? That vegetables can be protected through most of the winter?

- - - These things can and *are now* being done all over the country. Contractors are playing their part. Both farmer and contractor are and will profit as the field enlarges.

WATERLOO

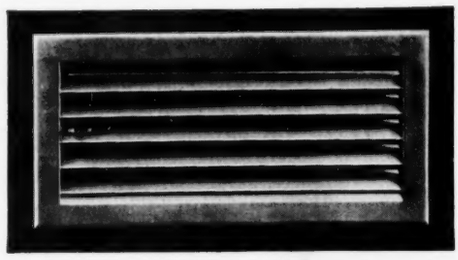
Air Conditioning REGISTERS

Waterloo Dealers Are 'Going Places'

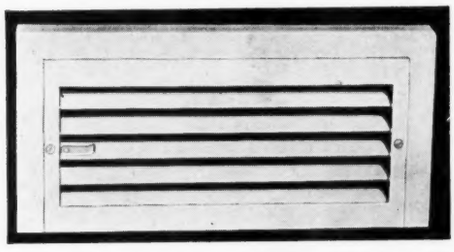
—with the industry's most modern registers

Get YOUR share of the increased 1937-38 profits you can make with Waterloo's increasingly - popular "Venetian blind effect" registers. The demand for these modern, strikingly beautiful registers has more than doubled in 12 months. Builders want them, not only for their modern smartness but for the many exclusive structural advantages they provide. That spells increased profits to YOU. For, ONLY WATERLOO DEALERS can offer such straight-line simplicity of design, such mechanical superiorities as—

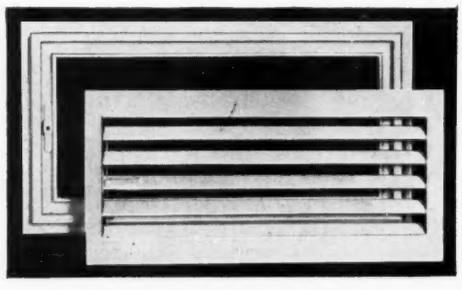
Slanted louvres which reflect light and color, conceal the ducts—Complete adjustable control of air flow (90-degree range)—Positive lock mechanism—Tested capacities.



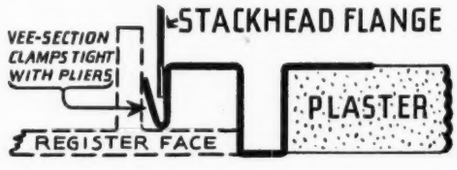
FH-100—Adjustable one-piece Venetian Type Register for walls.



FHD-204—Two-piece Venetian type adjustable Register for baseboards.



FH-102—Venetian Type adjustable Register for walls, with Vee-U plaster frame.



The Waterloo Vee-U Frame assures positive, tight connection with stack-head.

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Wall Registers . . . Oakwood Faces
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Send new catalog of Waterloo Registers, with new designs, new charts and installation data—without obligation.

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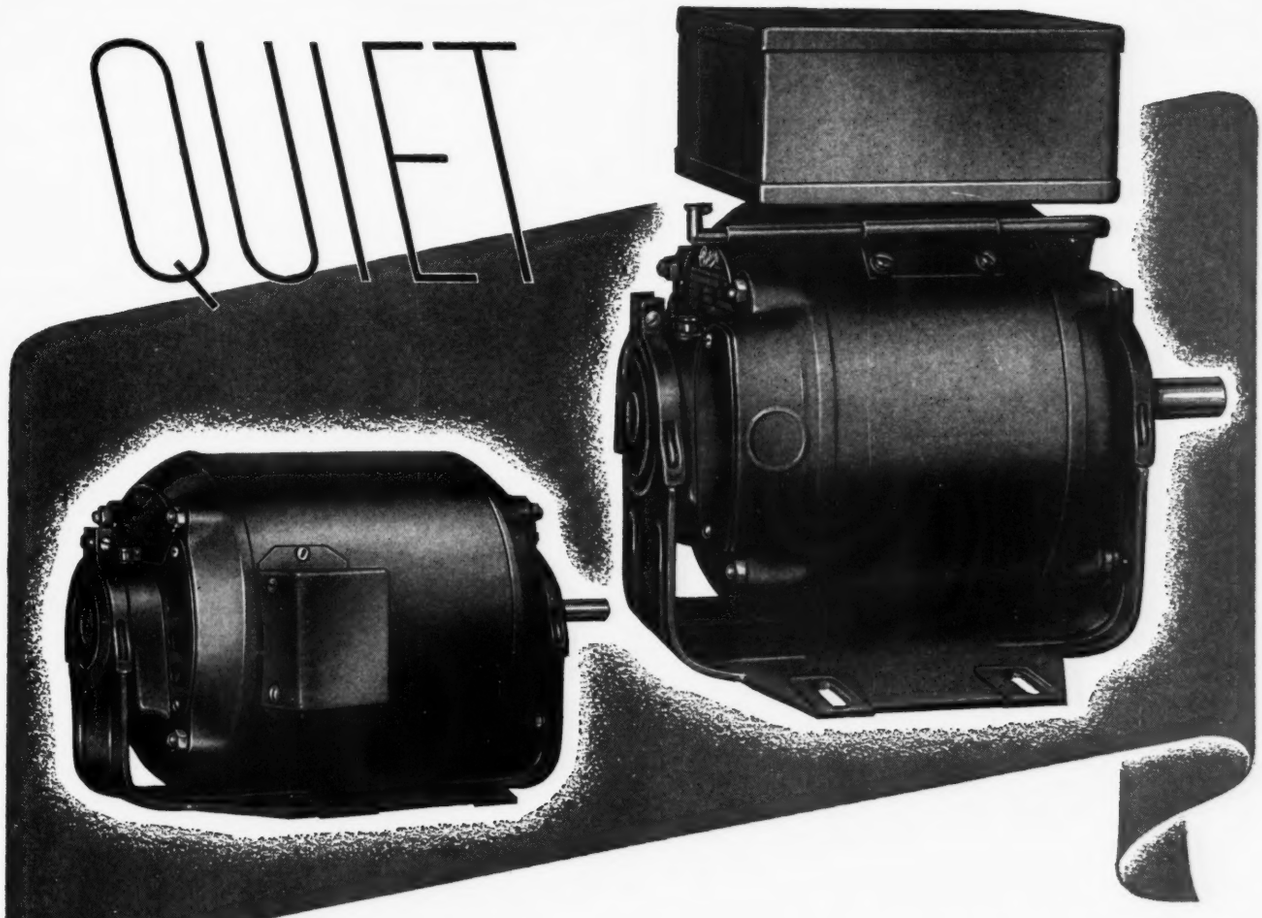

CUSHION MOUNTING MOTORS

The quiet operation of Century Motors meets one of the most important requirements in residential and commercial installations—driving Fans, Blowers, Room Coolers, Oil Burners.

The design and careful mechanical balance reduces noise and vibration to a minimum. Yet—Cushion Mounting prevents what little vibration there is from being transmitted to the rest of the installation.

Interchangeable mounting dimensions are provided for all types of Cushion Mounted Century Motors, whether for Single Phase—Polyphase—or Direct Current.

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SIZES UP TO 600 HORSE POWER

A New Up-to-the-Minute

EQUIPMENT DIRECTORY

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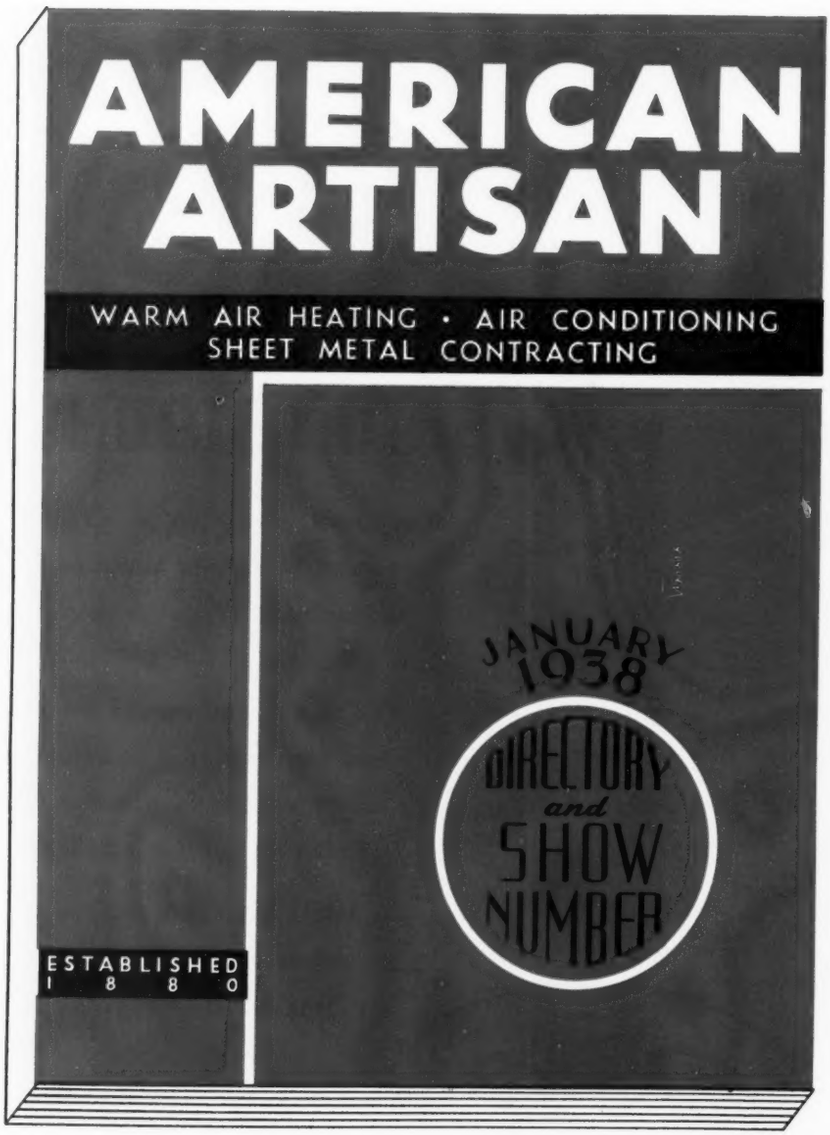


MANUFACTURERS:

Here is a monthly issue—and it comes only ONCE a year—in which your advertising lives ALL YEAR. After they have read about the Show and studied its many articles and data dealing with current problems, thousands of contractors and wholesalers will preserve the January 1938 issue for eleven months more . . . to use as a reliable and efficient buying and specifying guide. Many, in using the Directory, will turn to the advertising pages seeking additional information about your products after finding them listed in the Directory Section. Give them this information—make it easier for them to order from you—by making a full showing of your line. While the Directory and Show Section, as extra features, assure added and year-long attention for advertising, space rates are exactly the same as for any other issue. It is the one issue that you really "can't afford to miss."

Make Your

A Complete Preview of the

AIR CONDITIONING SHOW

IN THE REGULAR

1938 ISSUE

MARKING the beginning of its 58th year of service to the warm air heating, sheet metal, and residential air conditioning field, AMERICAN ARTISAN will again publish next January a large, special three-feature number. Work on this important issue is already well under way, and every effort is being pointed towards making the January 1938 number the largest and most useful issue of AMERICAN ARTISAN ever published.

FEATURE NUMBER ONE, which you have come to know and to look for every January, will be the 6th Annual Equipment Directory, containing complete and up-to-date listings of all warm air heating, sheet metal, and residential air conditioning products, their trade names, and the names and street and city addresses of all manufacturers. Use the new Directory, as you have the previous ones, to speed and simplify your buying of supplies and equipment during 1938. Every product you will need, every trade name you may want to look up, every manufacturer you may wish to contact will be listed so you can find them on an instant's notice.

FEATURE NUMBER TWO will be the Preview of the Fifth International Heating and Ventilating Exposition, which is to be held in New York City the last week of January. Besides giving you all the information you will need to help you decide what to see and hear at the Show, the SHOW SECTION of the January issue will present the complete program of the National Warm Air Heating and Air Conditioning Association meeting, which will be held at the same time and place. Get the most out of your trip by planning it beforehand with the aid of the Show Section.

FEATURE NUMBER THREE will be the large selection of outstanding articles on important warm air heating, sheet metal, and air conditioning design, fabrication, and installation problems . . . articles as helpful, authoritative, and as numerous as those you get in every other issue during the year.

THE big January 1938 number with the new Directory, the Preview of the Show, and many timely and practical articles will reach you about the middle of January. Watch for it. Make full use of each of its three valuable features.

Reservation for Space NOW

Big government jobs use Everdur

This photo shows ducts of non-rust EVERDUR Metal in U. S. Department of Commerce Building, Washington, D. C.

Longer life for air conditioning systems Better business for you

SOONER or later, failure of ducts in air conditioning systems due to rust and corrosion will involve costly replacements. Tell your customers that the moisture in humidified air will attack rustable ducts; tell them that leaking ducts will spoil the efficiency of the system and perhaps damage the walls; tell them that duct repairs are difficult and very expensive to make. Then, *recommend ducts of non-rust Anaconda Copper or EVERDUR Silicon Bronze!*

The extra cost? Quite a bit, but time will prove that these non-rust metals are more than worth it.

Where welded ductwork is desired, use Everdur Metal. It's as rustless as copper, as strong as steel, and readily welded by usual methods. 37242

Everdur Metal

RUSTLESS AS COPPER
STRONG AS STEEL

THE AMERICAN BRASS COMPANY, General Offices: WATERBURY, CONNECTICUT

Offices and Agencies in Principal Cities • In Canada: ANACONDA AMERICAN BRASS LTD., New Toronto, Ontario

*EVERDUR is a trade-mark of The American Brass Company, registered in the United States Patent Office.

ANTHRACITE HEATING NEWS

PUBLISHED BY ANTHRACITE INDUSTRIES, INC.
CHRYSLER BUILDING, NEW YORK

THE heating contractor selling Anthracite equipment is in an especially favorable position right now. Everywhere there is greatly increased interest in Anthracite heating, as a result of several new advantages, advances and economies.

❶ Anthracite is cleaner and more uniform than ever, due to improved processing facilities at the mines.

❷ The price situation with Anthracite is especially favorable. The cost of Anthracite has steadily gone down, while oil prices have gone up.

❸ The most favorable thing is the amazing new automatic Anthracite equipment. Everyone is talking about it. New highly efficient furnaces and boilers, with or without magazine feed. New almost humanlike automatic Anthracite burners. New automatic Anthracite water heaters. New thermostats. This new equipment provides a fresh, new selling story.

All this sales activity is further stimulated by the broad promotion program of Anthracite Industries, Inc., representing 80% of all the Anthracite mined.

●

Wide possibilities for basement modernization are opened with modern Anthracite equipment. This basement has been transformed into a hobby workshop.

F L A S H

Thermostat SALES NOW VERY ACTIVE

Thermostats offer you three great selling aids to start the heating season. They get you into homes, to tell the welcome story of "Automatic heat for a few dollars". They keep Anthracite users completely satisfied. They lead to sales of further Anthracite heating conveniences. Launch a campaign to get—

A THERMOSTAT ON EVERY BOILER OR FURNACE

Write for List of Approved Models

To transport the 1936 shipments of Anthracite, a train would have to be over 6800 miles long. Twice as long as the distance between New York and San Francisco. This train, of nearly one million cars, gives some idea of the important part that Anthracite plays in American comfort and prosperity.

●

Although automatic Anthracite burners (stokers) were introduced only a few years ago, sales this year are expected to reach an unprecedented figure. The stoker is one of America's fastest growing industries.

●

The cost of oil or gas is thought of in pennies, because they are sold in gallons or cubic feet. Anthracite costs DOLLARS a ton. Customers sometimes assume that oil or gas is cheap, whereas all-season heating costs prove the great economy of Anthracite. Tell your customers to think of heating costs in terms of the entire heating season. Point out that Anthracite, besides saving money, also makes it possible to store enough fuel to free them from worries about deliveries. Moreover, Anthracite can not leak, spill, or evaporate into dangerous fumes.

●

Different customers have different requirements for fueling convenience, and with Anthracite you can fit each need to a tee. A thermostat, and any adequate Anthracite furnace, or boiler, extends fueling periods up to twelve hours. Magazine feed boilers need no attention for 24 to 48 hours at a time. Automatic Anthracite burners automatically feed fuel and remove ash all season long.

This Seal of Approval appears on Anthracite equipment only after it has passed the most rigid tests in the heating field.

ANTHRACITE INDUSTRIES approved INCORPORATED

Pennsylvania ANTHRACITE COAL

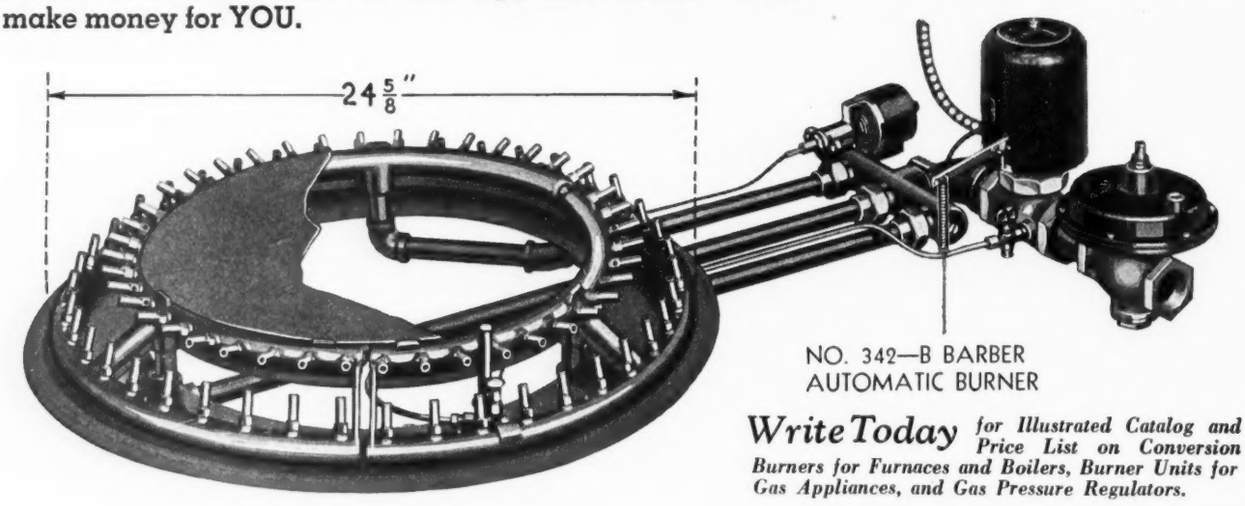
NOTE: When you visit New York see the complete and permanent display of the most modern Anthracite equipment at the Architects' Building, 101 Park Avenue, at E. 40th Street. The building is within a few minutes of Grand Central Station.

When You Say:
BARBER BURNERS—
You Say "Dependability"!

USED for heating thousands of homes and other buildings all over the country, under various fuel and climate conditions, in all types of furnaces and boilers—Barber Automatic Gas Conversion Burners have for many years taken first rank. Even a host of OLD-STYLE Barber Burners are today giving faithful, economical service. The latest models are built on the long famous Barber principle of combustion, which CANNOT be imitated, and include many refinements and improvements.

All Barber dealers are furnished with the utmost in cooperation and selling assistance. Proper protection is given to distributors and preferred dealers in restricted territories. By recommending and selling Barber Burners you assure to yourselves and your customers the solid satisfaction which accrues from a product of established merit. A Barber franchise is a valuable asset for ANY aggresive dealer—it will make money for YOU.

• The "B" Model shown here is built in eight different sizes to accommodate round grate diameters from 12" to 34". Models are also Tailor-made to SUIT and FIT grate dimensions of oblong furnaces and boilers, and to insure a "scrubbing" flame action against the side walls of fire-box. Barber's 1900° Fahrenheit Flame Temperature produces the highest possible efficiency and economy. Equipped with Baltimore Safety Pilot for positive and accurate Safety Control. Listed in the A. G. A. Directory of Approved Appliances.



NO. 342—B BARBER
AUTOMATIC BURNER

Write Today for Illustrated Catalog and Price List on Conversion Burners for Furnaces and Boilers, Burner Units for Gas Appliances, and Gas Pressure Regulators.

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BARBER BURNERS AND REGULATORS ARE DESIGNED FOR

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BARBER *Automatic* JET GAS BURNERS

FOR WARM AIR FURNACES, STEAM & HOT WATER BOILERS

Crise FLOATING CONTROL

The limit control is adaptable to warm air, steam or hot water plants. Compensates for weather changes without adjustment.

The thermostat is beautifully finished in either ivory or walnut. Single contact, no degree differential and never a failure.

Draft Regulator

Complete with Thermostat and Limit Control

for WARM AIR, STEAM or HOT WATER HEAT

THE first automatic draft regulator offered to the consumer, complete with all accessories to retail for less than $30.00 (plus installation) with a substantial profit for both distributor and dealer.

It plugs in like a floor lamp -- it's automatic -- no servicing. Motor has no transformer, no brushes, no contacts. Exceedingly powerful -- goes from high to low voltage within motor -- is permanently oiled. Spring return shuts draft if current fails. The limit control prevents overheating in furnace or boiler -- saves grates.

Sold to the Heating Trade Only EXCLUSIVELY

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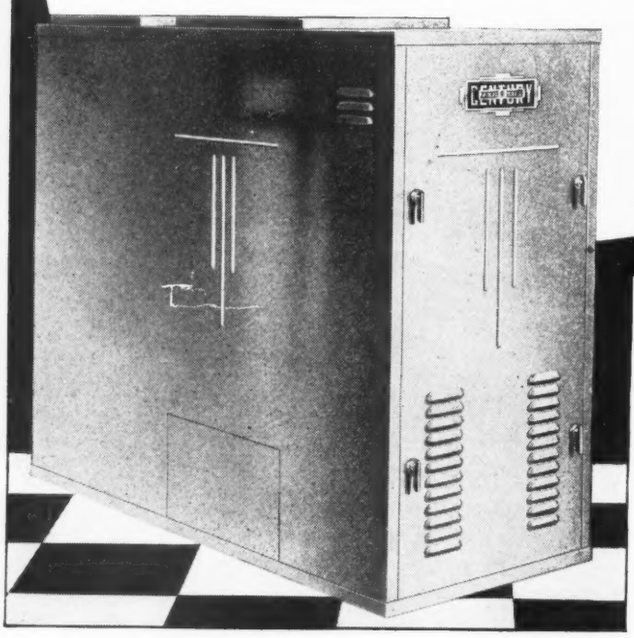
WAY OUT AHEAD

. . . say hundreds of enthusiastic CENTURY DEALERS

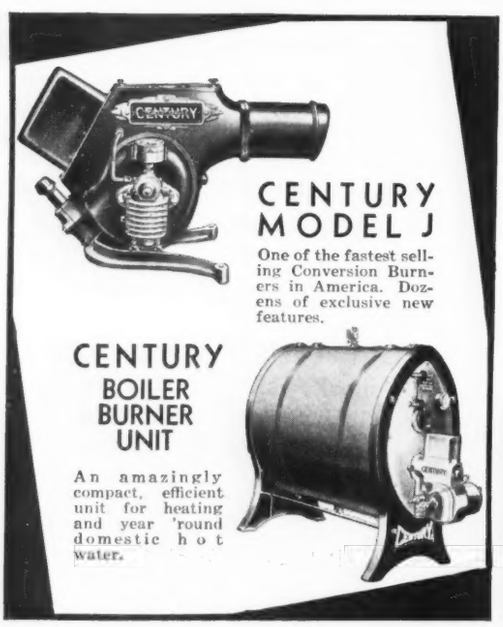


Century Complete Heating Unit Sales Soar as Home Building Hits New Peak!

Everywhere Century dealers are chalking up sensational sales records. With domestic construction up 200 to 300 per cent, Century Zeph-O-Lator Warm Air Conditioning Furnace Units, and Century Boiler-Burner Units more than double dealer volume and profit.

These strikingly designed, extremely compact, complete heating units offer so many outstanding advantages . . . more comfort . . . more convenience . . . plus maximum overall heating efficiency . . . they're amazingly easy to sell. Nothing bears out the truth of that statement better than the nation-wide Century sales record of thousands of installations.

Today, there are still available a few choice Century dealer franchises . . . a liberal, profit-sharing plan . . . with tried and proved sales methods that "click." Write today. The CENTURY ENGINEERING CORP., Cedar Rapids, Iowa.



CENTURY

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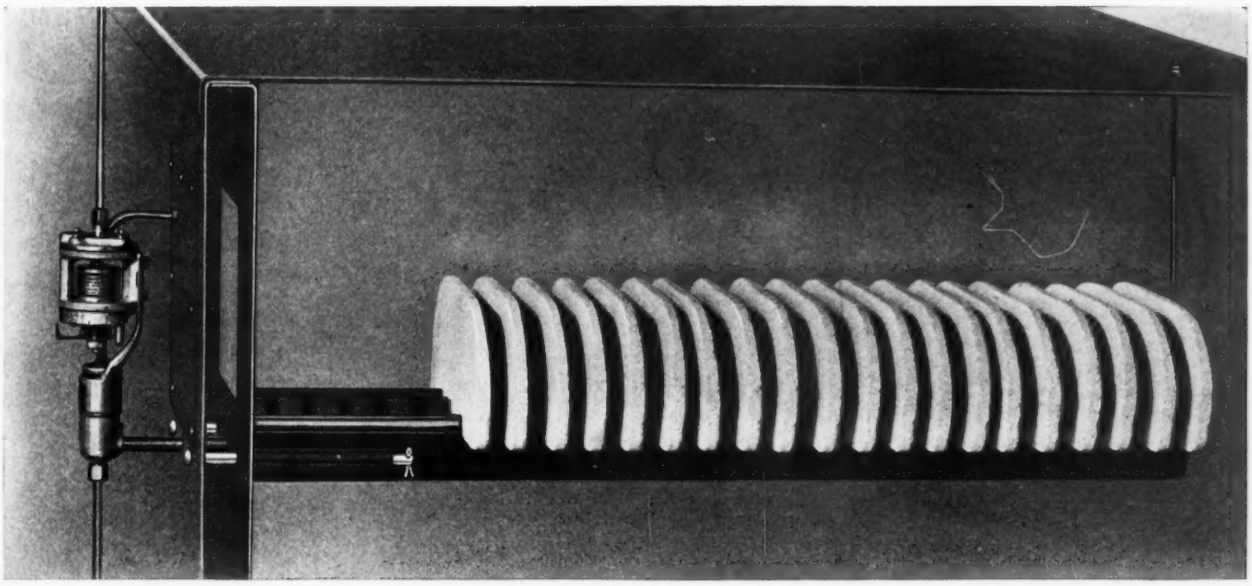
NOW SUPPLIED BY HIGH GRADE FURNACE MANUFACTURERS



Manufacturers of the higher grade air conditioning furnaces now standardize or recommend and sell Automatic June humidifying equipment because they know:

1. That Automatic June is the only humidifier providing enough evaporation with blower circulation during average and mild winter weather.
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3. That, no matter how high grade their furnace and the duct work may be, an inadequate, improperly controlled humidifier can completely disgruntle the owner.

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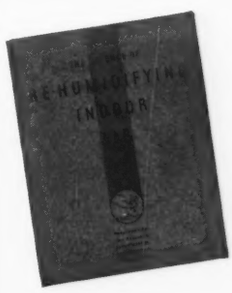

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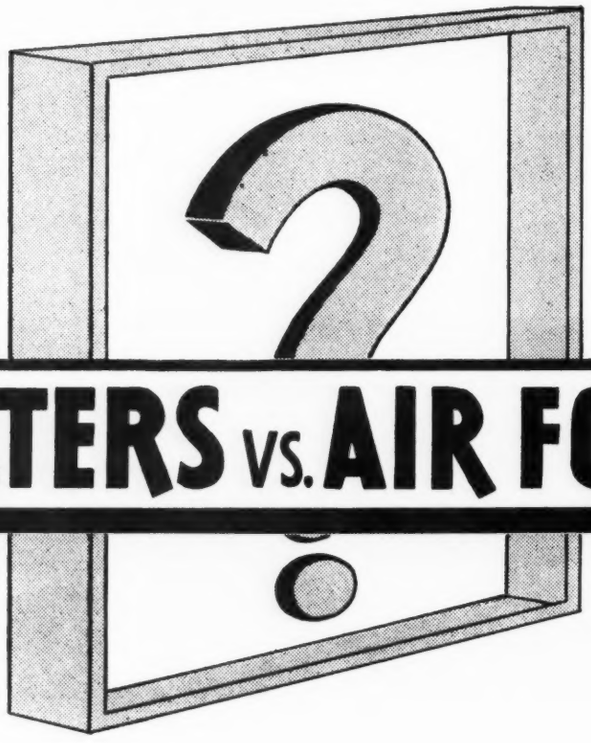

AIR FILTERS VS. AIR FOOLERS

DURING the *late* depression, price rather than quality was the principal consideration of most buyers, and manufacturers of domestic and commercial air conditioning equipment found their customers were no exception. To meet the situation and the highly competitive conditions in the field, manufacturers were forced to consider the first cost of every item that was a part of their air conditioning systems.

This was particularly true of air filters. Being a "hidden" part—one that did not show—and performing a function about which the owner knew very little, it was only natural that filter quality was sacrificed to price. In many cases these cheaper filters were so poorly designed that they were in fact "air foolers" rather than air filters. They required frequent replacement due to lack of dust holding capacity and defeated the purpose of the air conditioning system because of the resistance built up by their quick overloading with dirt. While low in first cost, these filters burdened the customer with frequent and expensive replacements which added to their dissatisfaction.

These experiences and the brighter business outlook of 1937 have caused a return to the use of better filters. Today, buyers of air conditioning equipment are demanding filters that are more efficient air cleaners and less expensive to maintain.

This has made it easy for manufacturers of air conditioning equipment to again offer permanent filters as standard equipment. Some farsighted and aggressive manufacturers supply permanent type filters only—others are listing permanent filters as optional equipment at a small extra cost.

Economically, this return to permanent type filters is sound, when it is considered that the satisfactory performance of an air conditioning system depends largely upon the efficiency of the filters used. Certainly 5% of the total cost, which is all that permanent filters represent, can be allowed for this important service.

The American Air Filter Co. has pioneered the development of permanent filter equipment to meet every air conditioning requirement. Complete data on the larger dust holding capacity, the higher efficiency and greater economy of permanent filters is available on request to manufacturers and dealers who wish to keep abreast of this latest trend in the air cleaning field.

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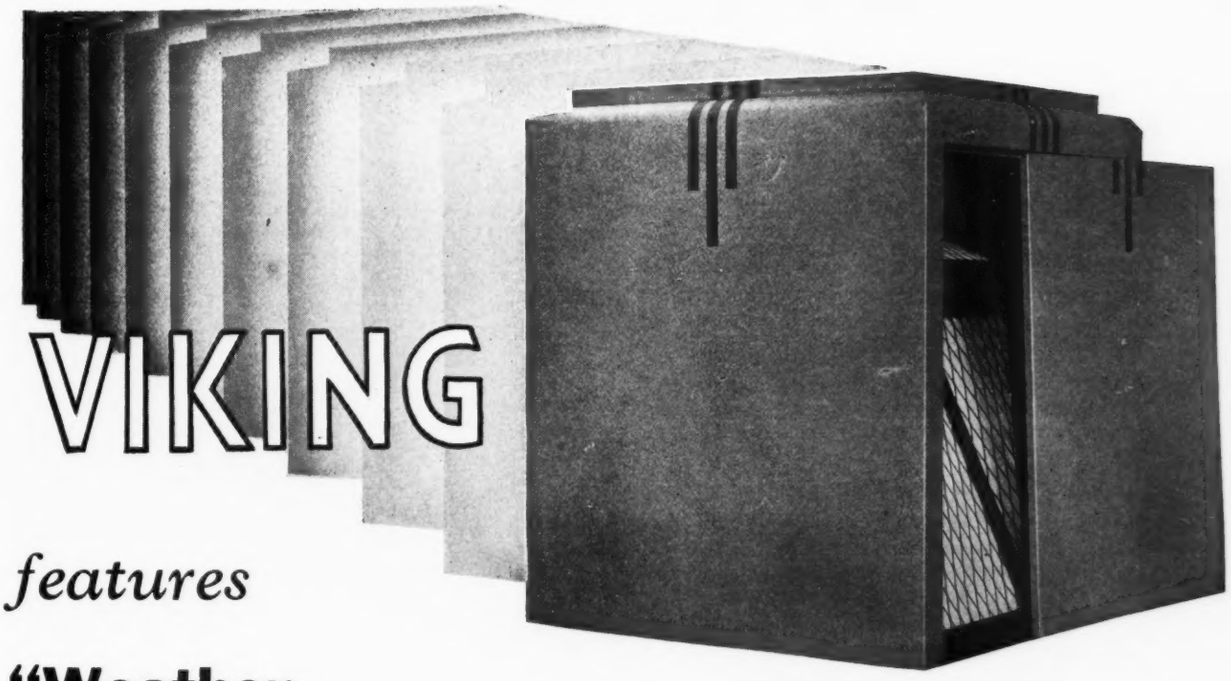

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—an efficient, automatic unit with positive shut-off, porcelain enamel tank, high evaporating rate —for accurate humidity control.

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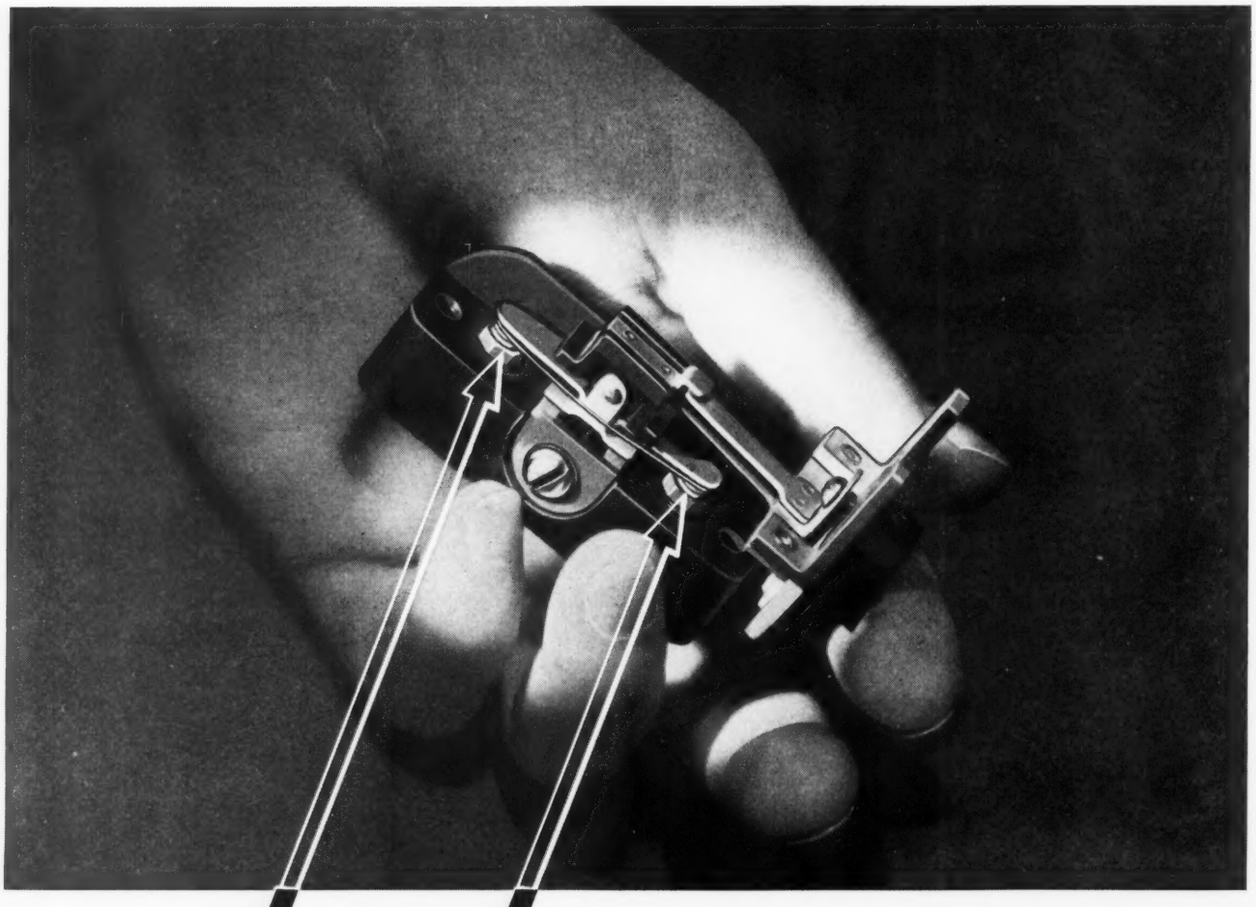

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The heart of any automatic control is its contact mechanism.

Perfex engineers recognized this fact. Since they had experience in other companies with all types of controls and switch mechanisms, they knew the shortcomings of other designs.

Using this valuable experience upon which to develop Perfex controls, they perfected this exclusive Twin Contact switch mechanism. It is an outstanding achievement, in that it definitely overcomes all of the troubles of existing mechanisms found in ordinary controls.

It has positive snap action — provides double protection against failure — eliminates troublesome lead wires — is immune to vibration, and permits Perfex controls to be installed in any position, thus eliminating leveling and fussy installation.

Get the benefits of this modern and experienced control design—specify Perfex controls on your burner, and thus reduce service calls.

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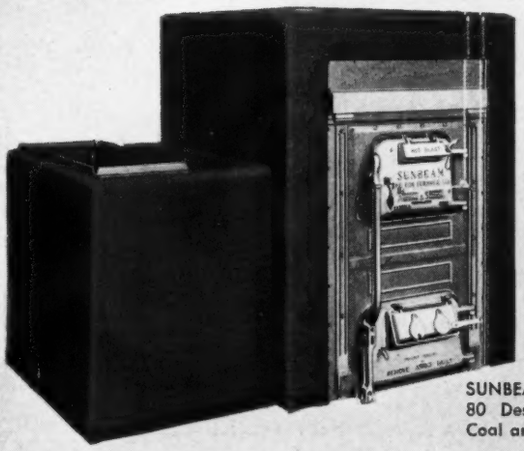

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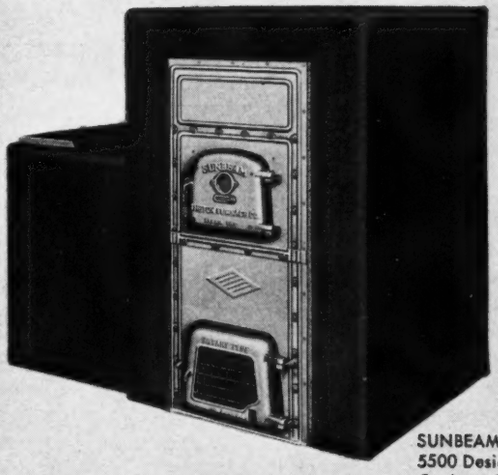

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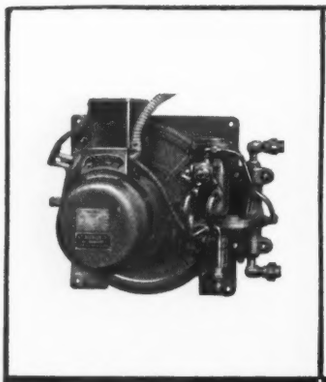
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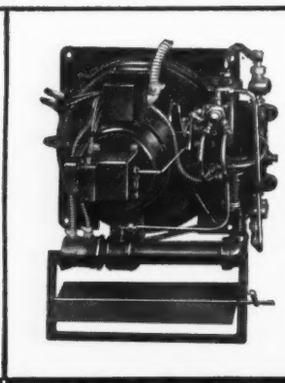
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Manual, semi-automatic and fully automatic rotary oil burners in all sizes for home or industry.
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"LADDI" DU-ALL combination boiler-burner unit for homes, is fully automatic, odorless, quiet and trouble-free. Furnishes heat or domestic hot water or both in combination at low cost.

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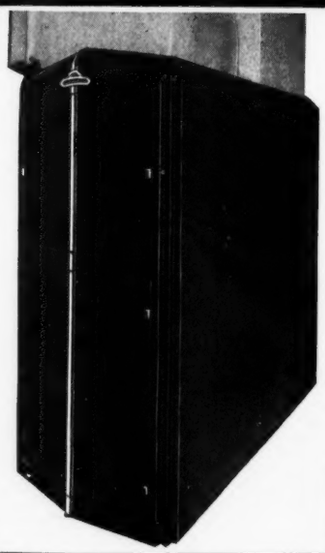

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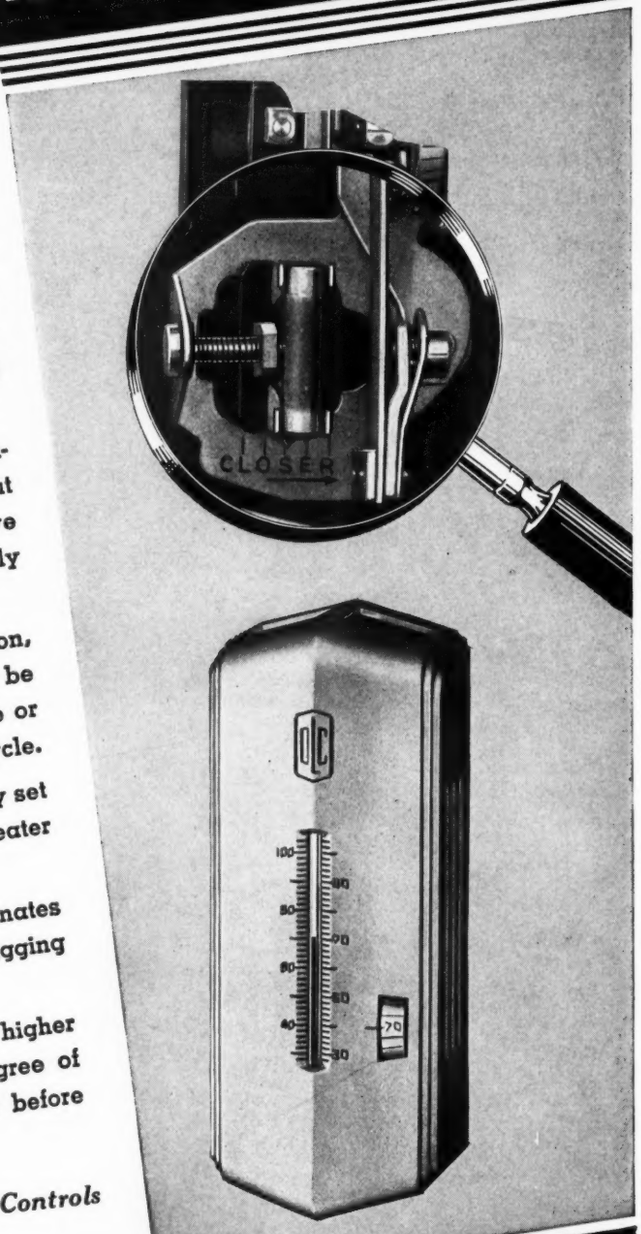

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Performance of Oil-Fired, Warm Air Furnaces in the Research Residence‡

By A. P. Kratz*
and S. Konzo**

THE investigations in forced-air heating in the Research Residence at the University of Illinois during the period from 1932 to 1934 were largely confined to studies of the characteristics of the forced-air heating system,[1] to studies of automatic controls, and to studies of the effectiveness of storm windows under actual service conditions. For these investigations the fuel used was anthracite. The investigation for the heating season of 1934-1935 was undertaken to determine the performance and operating characteristics of a warm-air furnace equipped with a conversion oil burning unit. For the heating season of 1935-1936 the conversion oil-burning furnace unit was replaced with a warm-air furnace designed specifically for oil combustion, and the performance and characteristics of the furnace were compared under identical conditions of operation with those obtained with the conversion unit.

Research Residence and the Heating Equipment

The Research Residence, shown in Fig. 1, together with the forced-air heating system is well known in the industry. The residence is a three-story structure of standard frame construction. The wall section consists of weather-boarding, building paper, sheathing, 6-in. studding, wood lath, and plaster with rough sand finish. The walls are not insulated and no weather stripping is used at the windows and doors. All the tests reported in this paper were made with ordinary, double-hung windows tightly locked.

The total space heated during these tests consisted of three rooms, a sun room, a breakfast nook, and a hallway on the first story; three rooms, a bathroom, and a hallway on the second story; and two rooms, a bathroom, and a hallway on the third story. The total volume of this heated space, from which the basement was excluded, was approximately 17,540 cu. ft. The calculated heat loss was approximately 137,500 Btu. per hour at an indoor-outdoor temperature difference of 70 F., and approximately 159,000 Btu. per hour at an indoor-outdoor temperature difference of 80 F. The residence is completely furnished, and during the heating season it was occupied by four people.

Fig. 1—View of Research Residence in Urbana, Ill.

The heating plant consisted of a warm-air furnace used in connection with a forced-air heating system. The duct system is shown in Fig. 2. Three cold-air returns were used which were connected to a cold-air box above the inlet to a centrifugal type fan. The furnace was placed at the east end of the basement, and the warm-air registers were served from two main trunk systems. The furnace used during the heating season of 1934-1935, shown in Fig. 3, was of the cast-iron, circular-radiator type, having a 27-in. firepot and 23-in. grate, and was equipped with a casing 50-in. in diameter. In order to accommodate the gun-type oil burner which was inserted through the ash-pit door of the furnace, the grates were removed and firebrick were arranged to form a cylindrical combustion space as shown in Fig. 3. Hereafter this combination of the furnace and burner will be referred to as the conversion unit.

During the heating season of 1935-1936 the furnace used, shown in Fig. 4, was of steel construction especially designed for oil burning. This furnace will be referred to hereafter as the oil-burning furnace. The burner was the same gun-type oil burner which was used in the conversion unit. Hence, any differences in performance of the two furnace installations could be attributed to the differences in the furnace and not to the differences in the type of oil burner used. The fan and furnace were built into a compact unit which was housed in an insulated casing. The values for the heating surfaces of the two furnaces are listed in Table 1, from which it may be noted that the oil-burning furnace

‡Paper presented at the 43rd Annual Meeting of the ASHVE, St. Louis, Mo., Jan., 1937, and published in Heating, Piping and Air Conditioning, Dec., 1936.

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**Special Research Associate, Engineering Experiment Station, University of Illinois.

[1]University of Illinois, Engineering Experiment Station, Bulletin 266 by A. P. Kratz and S. Konzo, 1934.

[1]University of Illinois, Engineering Experiment Station, Bulletin 266 by A. P. Kratz and S. Konzo, 1934.

Table 1—Areas and Dimensions of Furnaces

Heating Surface sq ft	Conversion Unit	Oil-Burning Furnace
Ashpit	11.38	....
Firepot	8.10	....
Tubes	...	59.5
Combustion Section	18.87	23.6
Radiator	31.93	19.0
Total, sq. ft.	70.28	102.1
Grate Area, sq. ft.	2.88	....
Refractory top section inside dimension, in.	Diameter 17.0	14.5x26.5
Combustion space,[a] cu. ft.	2.36	2.56

[a]The combustion space is regarded as that space enclosed within the refractory bricks.

had approximately 45 per cent greater heating surface than did the conversion unit.

The fuel oil burned was a No. 3 grade furnace oil having a specific gravity of approximately 36 deg. Baumé and a heating value of approximately 19,750 Btu. per lb.

The control of the heating plant was accomplished by means of a room thermostat operating to start and stop the oil burner and the circulating fan. This room thermostat was used in conjunction with two bonnet thermostats, one of the latter operated to stop the burner when the bonnet temperature exceeded a predetermined value, and the other operated to stop the fan when the bonnet temperature became less than a predetermined value. The room thermostat was located on an inside wall of the dining room at a height of 60 in. from the floor, and was adjusted to maintain an air temperature of approximately 71 F. at this level in all of the rooms of the Residence.

Tests Under Continuous Operation

In order to determine the capacity at the bonnet and the thermal efficiency of the furnaces for various conditions of operation, tests were made under conditions of thermal equilibrium with both the furnace and the fan operating continuously. In these tests, the temperature of the inlet air was maintained at approximately 70 F., and the quality of circulating air, the rate of oil input, the draft in the combustion chamber, and the amount of air required for combustion were maintained at predetermined values during the two-hour test period. These tests, which corresponded to the usual laboratory tests for the determination of the heat output of a heating unit, provided data for the heating unit only, without reference to the structure in which it was placed.

The quantities referred to as *capacity, combustion rate, bonnet efficiency,* and *overall house efficiency* are defined by the given equations:

$$\text{Capacity, Btu per hour put into air} = W \times 0.24 \times (T_b - T_i)$$

$$\text{Heat liberated in furnace, Btu per hour} = C \times H$$

$$\text{Bonnet efficiency, per cent} = \frac{W \times 0.24\ (T_b - T_i) \times 100}{C \times H}$$

$$\text{Overall house efficiency, per cent} = \frac{[(C \times H) - \text{Flue loss up chimney}]\ 100}{C \times H}$$

in which:

W = weight of air flowing in system per hour, lb.
0.24 = mean specific heat of air.
C = combustion rate, pounds of oil burned per hour.
H = calorific value of oil, Btu per pound.
T_i = temperature of air at inlet to furnace, F.
T_b = temperature of air at furnace bonnet, corrected for radiation, F.

Tests Under Service Conditions

The tests made under service conditions differed from the tests made under continuous operation in that the operation of the burner and fan was automatically controlled to maintain a temperature of 71 F in all the rooms of the house rather than to maintain a constant capacity at the furnace bonnet. Therefore, in all these tests the operation of the burner and fan was inter-

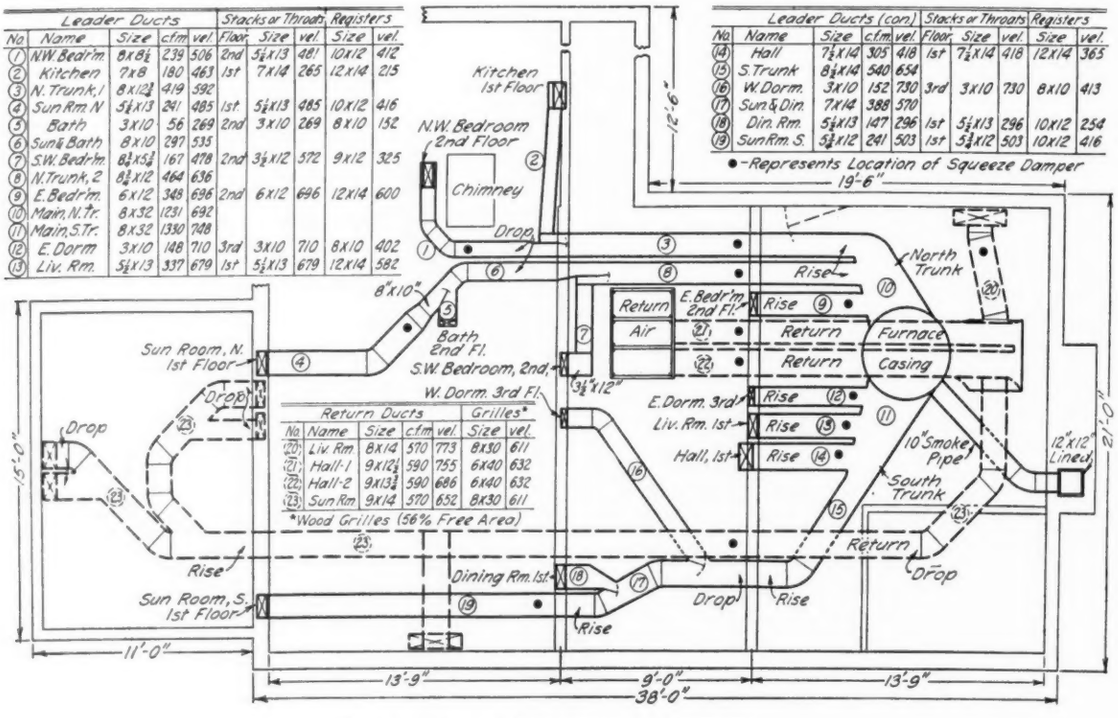

Leader Ducts
No. Name Size c.f.m. vel. Stacks or Throats Floor Size vel. Registers Size vel.
(1) N.W. Bedr'm 8x8½ 239 506 2nd 5½x13 481 10x12 412
(2) Kitchen 7x8 180 463 1st 7x14 265 12x14 215
(3) N. Trunk, 1 8x12¾ 419 592
(4) Sun Rm. N 5½x13 241 485 1st 5½x13 485 10x12 416
(5) Bath 3x10 56 269 2nd 3x10 269 8x10 152
(6) Sun & Bath 8x10 297 535
(7) S.W. Bedr'm. 8¾x5¾ 167 478 2nd 3½x12 572 9x12 325
(8) N. Trunk, 2 8¾x12 464 636
(9) E. Bedr'm. 6x12 348 696 2nd 6x12 696 12x14 600
(10) Main, N. Tr. 8x32 1231 692
(11) Main, S. Tr. 8x32 1330 708
(12) E. Dorm 3x10 148 710 3rd 3x10 710 8x10 402
(13) Liv. Rm. 5½x13 337 679 1st 5½x13 679 12x14 582
Leader Ducts (con.)
(14) Hall 7½x14 305 418 1st 7½x14 418 12x14 365
(15) S. Trunk 8½x14 540 654
(16) W. Dorm. 3x10 152 730 3rd 3x10 730 8x10 413
(17) Sun & Din. 7x14 388 570
(18) Din. Rm. 5½x13 147 296 1st 5½x13 296 10x12 254
(19) Sun Rm. S. 5½x12 241 503 1st 5½x12 503 10x12 416
Return Ducts
(20) Liv. Rm 8x14 570 773 Grilles* 8x30 611
(21) Hall-1 9x12½ 590 755 6x40 632
(22) Hall-2 9x13¾ 590 686 6x40 632
(23) Sun Rm. 9x14 570 652 8x30 611
*Wood Grilles (56% Free Area)
●-Represents Location of Squeeze Damper
Kitchen 1st Floor
N.W. Bedroom 2nd Floor
Chimney
Drop
Rise
North Trunk
Return Air
E. Bedr'm 2nd Fl.
Return
Furnace Casing
8"x10"
Bath 2nd Fl.
S.W. Bedroom, 2nd
W. Dorm. 3rd Fl.
3½"x12"
E. Dorm. 3rd
Liv. Rm. 1st
Hall, 1st
10" Smoke Pipe
12"x12" Lined
South Trunk
Sun Room, N. 1st Floor
Sun Room, S. 1st Floor
Dining Rm. 1st
19'-6"
21'-0"
15'-0"
11'-0"
13'-9"
9'-0"
38'-0"

Fig. 2.—Plan of duct system in basement.

mittent in character and not continuous, and the test periods were 24 hours in length instead of 2 hours.

Observations of fuel consumption, flue gas analyses, power input to the fan motor and burner motor, flue gas temperatures, temperatures of the air in the ducts and at the registers, and room temperatures were made daily at 7:00 a.m., 11:00 a.m., 4:00 p.m., and 10:00 p.m. The total times of operation of the fan and of the burner for a 24-hour period were obtained by means of self-starting, electric clocks placed in the electrical circuits of the motors. In addition, continuous records of temperatures and CO_2, such as shown in the typical records in Fig. 5, were obtained for each 24-hour period.

Results of Tests Under Continuous Operation

No attempt was made to determine virtual capacities or efficiencies of the plant with intermittent operation of the fan. Average temperatures and air weights would be meaningless unless the various readings were weighted in some way proportional to the length of *on* and *off* periods. Periods during which temperatures were increasing or decreasing while air weights remained constant complicated the situation, and made it impossible to determine any proportionality factor based on time. Furthermore, all quantities were not involved to the first power alone, and the average of a number of instantaneous results involving multiplication, division, addition, and subtraction indiscriminately is not numerically equal to the result obtained by the same form of calculation applied to the averages of the several factors, particularly when these factors are varying from zero to a maximum. Hence the actual efficiency and capacity of the furnace on intermittent fan operation are indeterminate, and a statement of such quantities based on arbitrary approximations would be meaningless. The performance of the plant was therefore studied under conditions of continuous fan operation.

In the case of a gravity warm-air furnace, in which a unique relationship exists between the combustion rate, the air volume, and the register temperature, the capacity will be a definite value for any given furnace installation if the combustion rate alone is specified. However, in the case of a forced-air furnace system, no such definite relationship exists between combustion rate and air volume, and as a consequence the capacity is dependent on more than the combustion rate alone. These studies of performance characteristics under conditions of continuous operation were, therefore, undertaken to obtain the relationships existing among some of the factors that determine the capacity of oil-burning furnaces. In general, the capacity and efficiency of oil-burning furnaces are dependent upon seven factors, which may be grouped into two classifications as shown in Table 2.

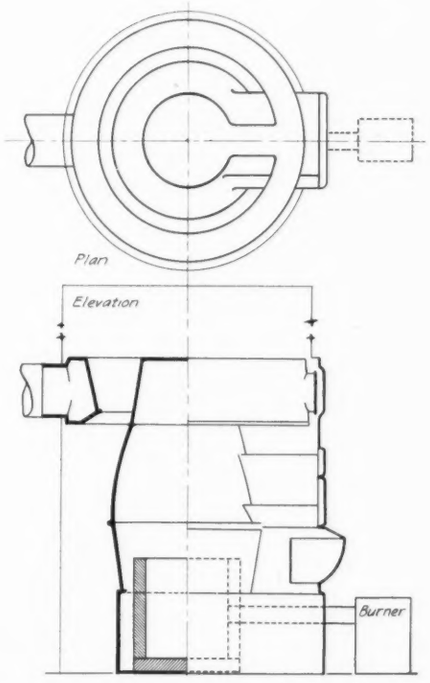


Fig. 3—Diagram of conversion oil-burning unit

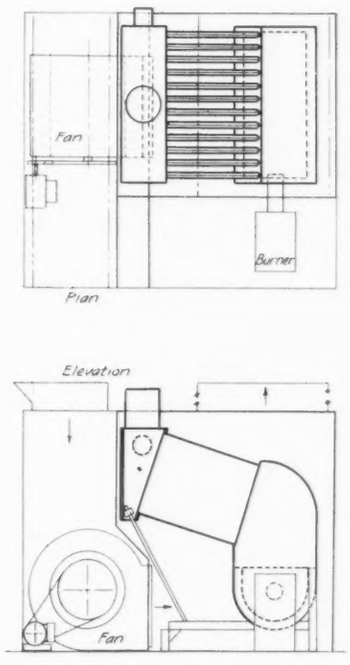


Fig. 4—Diagram of oil-burning furnace

Table 2—Factors Affecting Capacity and Efficiency of an Oil-Burning, Warm-Air Furnace

I. Combustion characteristics
   1. Type of burner
   2. Rate of oil input
   3. Percentage of CO_2 in flue gas
   4. Conditions of draft in combustion chamber

II. Furnace characteristics
   5. Amount and location of heating surfaces
   6. Size and shape of combustion space
   7. Quantity of air circulated

It may be noted from Table 2 that for any given installation of burner and furnace, items 1, 5, and 6 are fixed, and items 2, 3, 4, and 7 are independently variable. However, in all of the tests reported in this paper, the draft in the combustion chamber (item 4) was maintained by means of an automatic draft regulat-

ing damper at a value of 0.02 in. of water, which was sufficient to insure the positive removal of the flue gases. Hence, the studies on furnace performance consisted of tests in which the rate of oil input, the percentage of CO_2 in the flue gas, and the quantity of air circulated were independently varied in magnitude.

Variations in Air Quantity

The results obtained from the conversion unit are shown in Fig. 6. For these tests, the CO_2 in the flue gas was maintained constant at a value of 9.5 per cent, and the effect of varying the quantity of air circulated over the heating surfaces of the furnace was studied. The results shown are typical and are similar in nature to those obtained from tests on the oil-burning furnace installation made under similar conditions of operation. The full lines in Fig. 6 represent results obtained with constant rates of oil input to the furnace. It may be noted that for a given rate of oil input, both the capacity and efficiency of the furnace increased as the quantity of air circulated over the heating surfaces was increased. For example, at a 9.66-lb oil input rate, the capacity was increased from 120,000 Btu per hour to 140,000 Btu per hour when the air quantity was increased from approximately 1380 cfm to 2240 cfm. This represented an increase in capacity of approximately 17 per cent for an increase in air quantity of approximately 62 per cent. The corresponding increase in bonnet efficiency under these conditions was from 63 per cent to 74 per cent.

It may also be noted from Fig. 6 that the increase in capacity for a given increase in air quantity became smaller as the air quantity was increased. For example, an increase in air quantity from 1400 cfm to 1600 cfm resulted in an increase in capacity of 6500 Btu per hour; whereas an increase in air quantity from 2000 cfm to 2200 cfm resulted in an increase in capacity of only 2500 Btu per hour. It is apparent from these tests that in order to facilitate the transfer of heat from the heated surfaces to the circulating air, an adequate circulation of air over the heating surfaces should be provided.

Variations in Oil Input Rate

The performance curves in Fig. 6 show also that for a constant quantity of air circulated, the capacity and efficiency of the furnace are dependent upon the rate of oil input to the burner. In order to show more clearly the relationship between oil input and capacity, the values for an air quantity of 1675 cfm shown in Fig. 6 have been plotted in Fig. 7. Similar curves for the

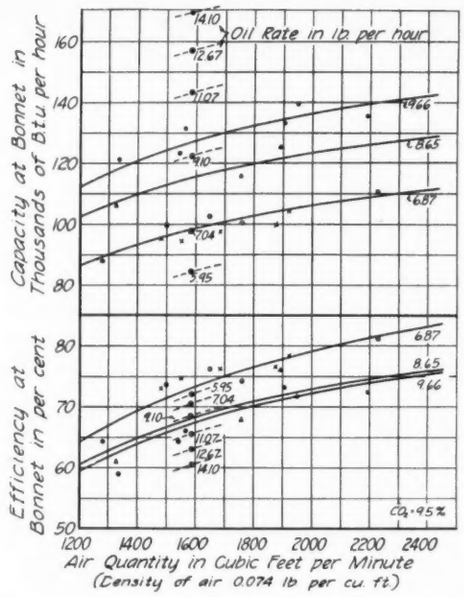


Fig. 6—Performance curves of conversion unit in forced-air heating system

oil-burning unit are also given. The broken lines represent results obtained with the conversion unit, and the full lines represent results obtained with the oil-burning furnace.

It may be noted for both furnace units that the capacity at the bonnet increased as the rate of oil input, or its equivalent which is the rate of heat release in the furnace, was increased. In the case of the conversion unit, an increase in the heat release of from 120,000 Btu

(*Continued on page* 88)

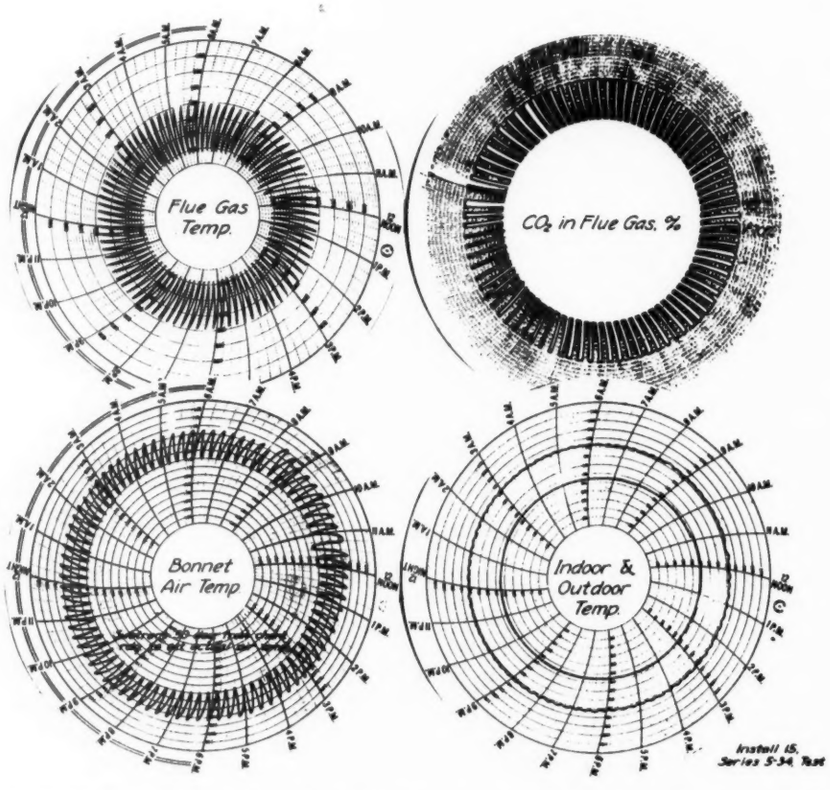


Fig. 5—Typical records showing operation with conversion oil furnace used with forced-air heating system in Research Residence

Pattern Development for

Air Conditioning Fittings*

By William Neubecker
Head Instructor,
Sheet Metal Department, New York Trade School

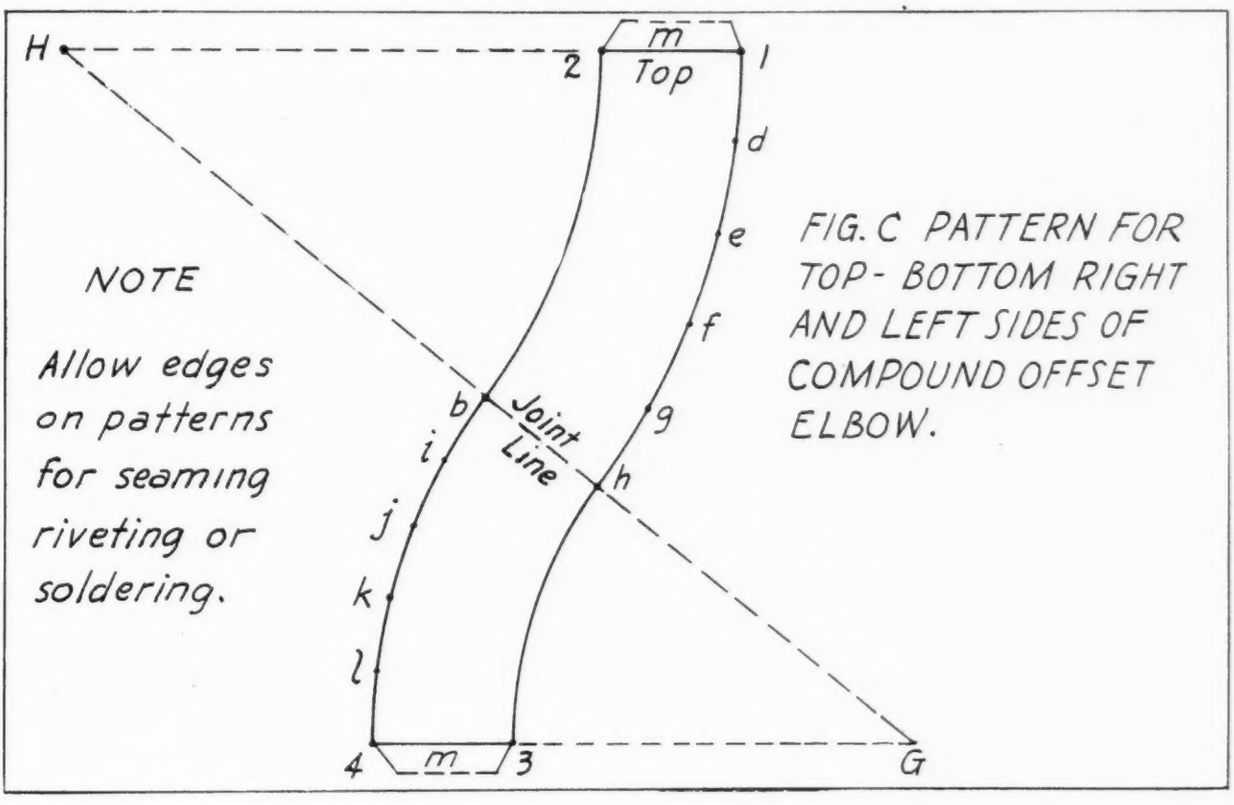
Compound Offset Elbow

A READER sends in a request for patterns for a double offset elbow, together with a rough sketch indicating what he wants, which has been redrawn and reproduced in Fig. A. The pattern solution which our correspondent desires shows a *square* duct 8 in. by 8 in. running along the ceiling, then dropping down 12 inches to pass under the 10 in. by 10 in. girder (all as shown in front elevation) and at the same time projecting toward the reader a distance of 12 inches from the wall line as indicated in the plan, to produce a double curved compound offset fitting.

The end elevation shown at the right off the front elevation, indicates the drop and projection, and is the only view required when developing the pattern shape. The compound offset must have an equal area throughout its entire length. Regardless of what the drop, projection or length of the offset may be, the method of developing the pattern shape, is applicable to all conditions and is developed as follows:

Knowing the size of the duct, its drop and projection, draw the end elevation as shown in Fig. B. Number the corners in the upper section *P*, 1, *2*, *3* and *4* and in the lower section *R*, 1′, *2′* *3′*and *4′*. Draw the diagonal line 1 to *3′* connecting the square sections of

*All rights reserved.



PATTERN FOR DOUBLE COMPOUND OFFSET ELBOW CONNECTING TO SQUARE DUCT— A REQUEST BY A READER

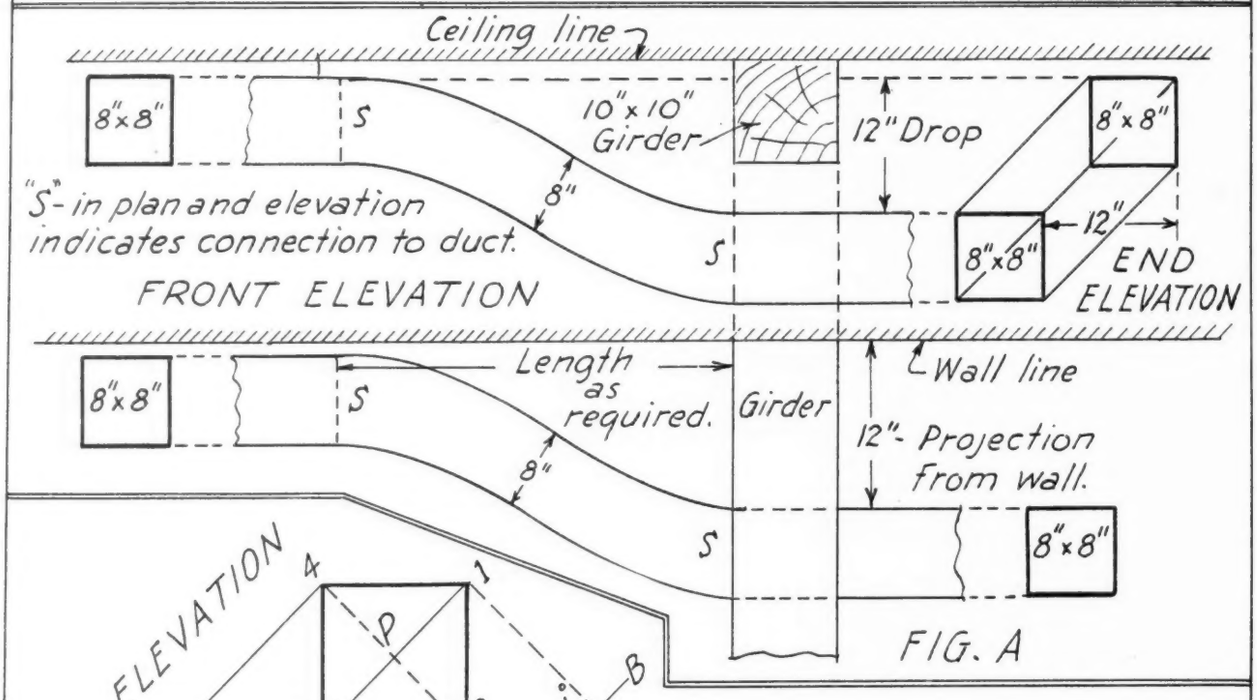
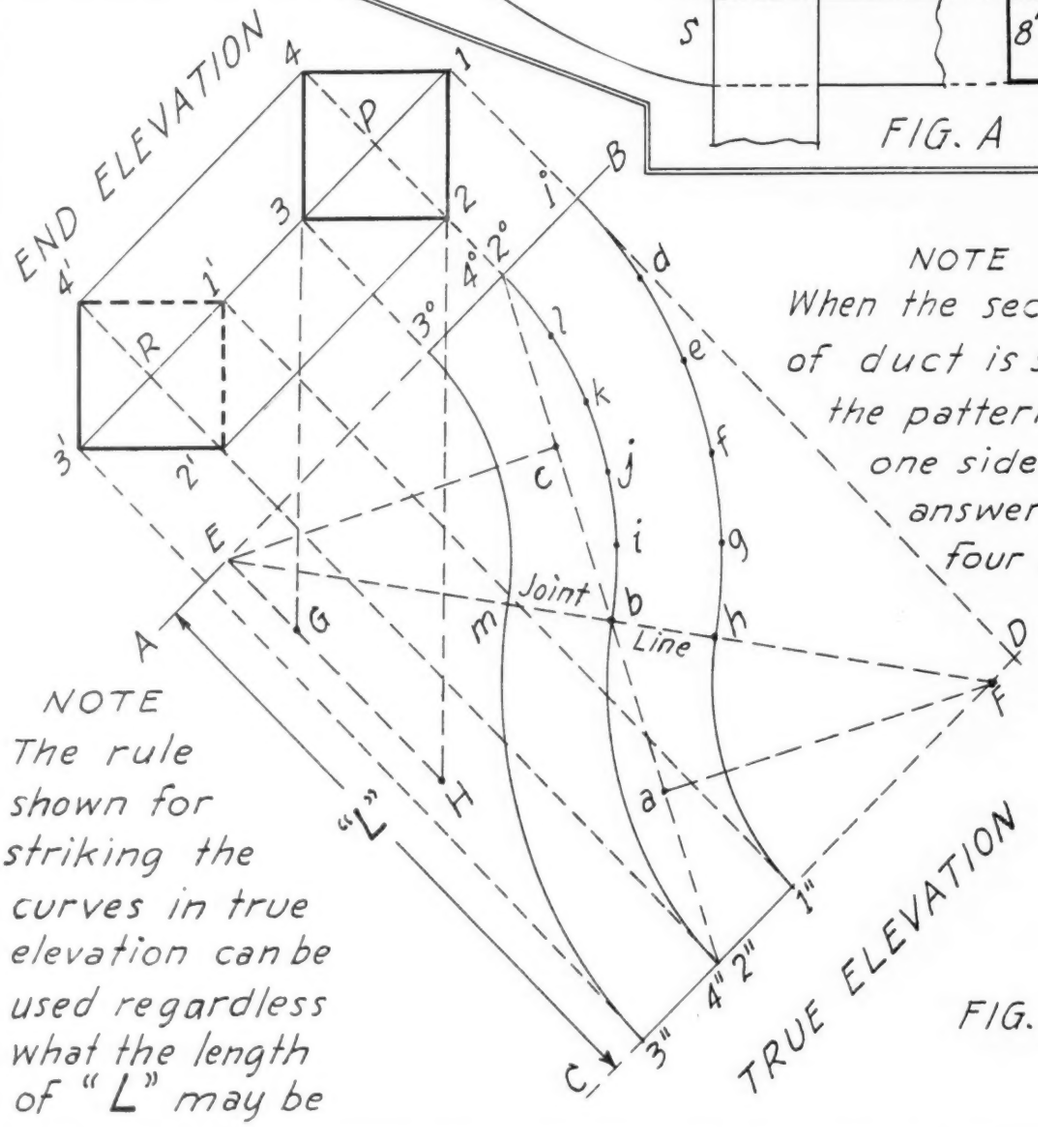


FIG. A



NOTE
When the section of duct is square the pattern for one side will answer for all four sides

NOTE
The rule shown for striking the curves in true elevation can be used regardless what the length of "L" may be

FIG. B

the duct *P* and *R*. Parallel to 1-*3'* draw the line *A-B*. Set off the required length of the offset at right angles to *A-B* as indicated by "*L*" between the arrow points and from *C*, parallel to *A-B* draw the line *C-D*.

Now at right angles to *A-B* from the corners 1 to *4* in the section *P*, draw lines to intersect line *A-B* at 1°, *2*°, *3*° and *4*°. In a similar manner at right angles to *A-B* from the corners 1' to *4'* in section *R* drop lines to intersect the line *C-D* at 1", *2*", *3*" and *4*".

When drawing the *true* elevation of the offset elbow, we assume that the double curve sweeps will be such that both the upper and lower curves will be similar, so that the upper one can be used for the lower or vice versa. In case the length of the offset is very long, a joint can be made in the center, as at *m-h* in the *true* elevation.

To draw these similar upper and lower curves within given dimensions, the following rule should be employed. Find the centers of the upper and lower sections of the duct on the lines *A-B* and *C-D* respectively, as indicated by *2*°/*4*° at the top and *2*"/*4*" at the bottom. Draw a line connecting these two intersections as shown and divide it in four parts as shown by *a*, *b* and *c*. At right angles to this line *2*°-*2*", draw a line from point *c* to intersect the upper line *A-B* at *E*.

In similar manner at right angles to *2*°-*2*", draw a line from point *a* to intersect the lower line *C-D* at *F*. Draw the dividing or joint line *E* to *F*. Now using *E* as center with radius equal to *E-3*°, *2*°/*4* and 1°, draw arcs to meet the joint line at *m*, *b* and *h* respectively. In similar manner using *F* as center with radii equal to *F*-1", *2*"/*4*" and *3*" draw arcs to meet similar arcs previously drawn, at *m*, *b* and *h*.

Thus it will be noted that the radii for both upper and lower curves are similar, so that either the lower or the upper curves is all that is required when laying out the pattern in practical work.

Flaring Pattern

The next step is to find the radii with which to strike the flaring pattern. In this case the radii will be obtained by extending the sides of the *upper section P* in the end elevation, to meet the line drawn from the *center point E* in the true elevation, with which the *upper curves* were struck. If desired similar radii could be obtained by extending the sides in the *lower section R* in end elevation, to meet the line not shown drawn from the *center point F* in the true elevation, with which the *lower curves* were struck.

Now from the center *E* at right angles to *A-B* draw the line *E-H* of indefinite length and intersect it at *G* and *H* by extending the sides *4-3* and 1-*2* in section *P*, respectively. *G-3-4* and *H-2*-1 then become the radii for developing the pattern shape. Space the outer curve 1°-*h* and the center curve *b-4*° in the *true* elevation into equal divisions as shown by *d*, *e*, *f*, *g* and *i*, *j*, *k*, *l* respectively.

Laying Out the Pattern

The pattern is now in order and is laid out as follows: Take the radius *H*-1 in *true* elevation and set it off on the horizontal line in Fig. C, from *H* to 1. Using *H* as center with same radius draw an indefinite arc 1-*h*. Now take the girth of the outer arc 1° to *h* in the *true* elevation in Fig. B and step off these five divisions on similar arc 1-*h* in Fig. C as shown by similar letters. From the center *H* draw a radial line through *h* extending it indefinitely. Now use *H-2* in *true* elevation in Fig. B as radius and with *H* in Fig. C as center draw the arc *2-b* to intersect the radial line *H-h* at *b*.

Take the radius *G-4* in *true* elevation in Fig. B and step off this length in Fig. C on the radial line *H-G* from *b* to *G*. Using *G* as center with the same radius, strike an indefinite arc *b-4*. Take the girth from *b* to *4*° in the *true* elevation in Fig. B and step off these five divisions on the arc *b-4* in Fig. C as shown by similar letters and draw the radial line *4-G*. Take the width *2*-1 at the top of the pattern shape and set it on the line *4-G*, from *4* to *3*. Use *G* as a center and draw the arc *3-h* to meet the upper arc on the joint line at *h*. This radius *G-3* will, of course, be similar to the radius *G-3* in the true elevation in Fig. B. 1-*2-3-4* in Fig. C will be the pattern shape for all four sides of the compound offset.

Using but one pattern for all four sides, occurs only, when the section of the duct is *square*. As the upper and lower curves in the true elevation in Fig. B are similar, either set of curves can be used for obtaining the girths for the pattern shape.

In this problem the upper curve was used and the girths transferred to the pattern shape in Fig. C as indicated. Flanges have been added for drive cleats at top and bottom of pattern as shown by *m*. Edges or flanges must be allowed along the curves of all patterns for either seaming, riveting or soldering. If the offset is of a long length, it can be made in two parts with a joint at *b-h* in the pattern. This facilitates seaming or riveting and makes it easy to assemble. When assembling the offset, the following suggestions may not be out of place. Cut two pattern shapes with laps and two without. Mark off all of the four pattern "TOP" and the *top corners 2* and 1 as shown.

Join together two halves; corner I meeting corner I on both halves. Then turn the one half upside down and join the two halves to complete the offset elbow.

◆

One purpose of this series is to establish, for the first time, practical patterns for commonly used air conditioning duct fittings. Not all fittings are included in the series, but Mr. Neubecker will supply patterns for additional fittings if the fitting is commonly used.

◆

Air Conditioning Applications To Wisconsin Agriculture*

By S. A. Witzel
Department of Agriculture,
University of Wisconsin

ONLY a few years ago we heard about air conditioning for the first time. In general, the public became acquainted with this new development here in Chicago at the Worlds Fair in 1933 and 1934. Technically speaking, the principles involved are not new. Heating engineers have been concerned with heating principles, refrigeration engineers have been working with refrigeration principles and ventilation engineers have been working with ventilation principles since the advent of the steam engine, meat packing plants and deep underground mines. But, here, in the short span of a few years, all three have been *brought* together under the common professional classification as air conditioning engineers.

The agricultural engineer has a distinct place in this new field of air conditioning. His problems may vary from the complete air conditioning of farm homes to the seasonal air conditioning of other farm structures such as storage buildings, poultry houses, barns and hog houses. Year around air conditioning with temperature and humidity control will require heating equipment, humidifiers, filters, forced air circulation and cooling equipment, while other farm structures air conditioned for temperature and moisture control for shorter periods may involve only the heating equipment or the refrigeration equipment together with equipment for humidity control and with or without forced air circulation and air filters or washers.

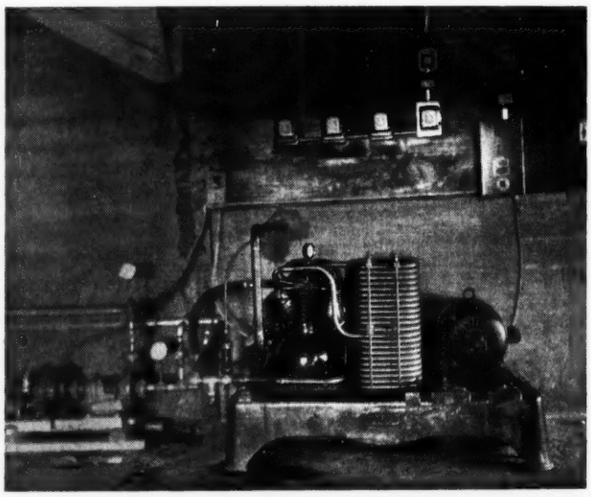
Temperature and humidity control are phases of air conditioning destined to play an ever growing part in modern agriculture. The following are brief descriptions of application on Wisconsin farms.

Apple Storage. In the summer of 1931 an orchard owner in western Wisconsin built a large apple storage cellar 30'x50' in a hill next to the packing shed. Apples were picked and placed in this common storage cellar until they could be packed and sent to market. A slatted floor was provided. The earth beneath was saturated or covered with water, and this provided a high humidity which was essential to prevent shrinkage. A temperature of from 55-65 degrees was maintained. The storage cellar served a very useful purpose in that it extended the packing season somewhat.

The apple market frequently fluctuates quite rapidly, and even a few days after the picking of some varieties is over the market may show a decided improvement. When apples can be held for one or several weeks and their quality maintained, a much higher market value may frequently be realized. With this late market in mind a cooling system was installed in 1935.

This apple storage room is held at 55-65 degrees by means of unit coolers and compressors. Humidity is maintained by means of saturated earth under a slatted floor.

The cooling system consisted of a compressor and



Water is cooled by the compressor and circulated through the coolers with the pump shown. A small cooling tower permits the use of the same water over and over again.

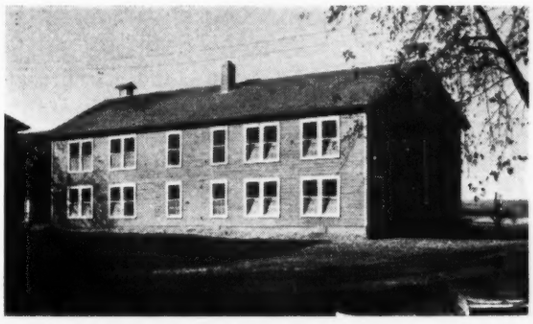
*A report presented at the winter meeting of the American Society of Agricultural Engineers, 1936.

cooling water pump driven by electric motor. A large supply of cooling water was not available except at a prohibitive cost, so a cooling tower was erected and the same cooling water is used throughout the season. The four cooling units in the storage cellar have automotive type radiators and electrically operated fans to force air through them. Piping for two cooling units was also provided in the basement of the basket and ladder storage house adjoining the large storage cellar and packing shed.

Storage capacity of the large cellar is estimated at 5,000 bushels of apples in baskets, and the small adjoining basement will hold approximately 2,000 bushels.

Because of the drying effect of air in rapid motion, there was some doubt as to the effect of the fan operated unit coolers on the fruit. However, the slatted floor and moist earth beneath provided sufficient moisture for satisfactory humidity conditions. The cellar was not insulated in the 1935 season, and while satisfactory storage temperatures were maintained the electric bill was very high. Meter tests showed the meter to be unreliable, so the exact energy requirements are not known. Preliminary estimates of electric charges for this season indicate very reasonable operating costs. This year two-inch cork board set in hot asphalt was applied to the exposed walls. This same type of insulation will be applied to the ceiling.

The temperature was held at 35 to 40 degrees and humidity at 75 to 80 percent this past season. Temporary storage of apples occurred after each variety was picked during the harvesting season, and the storage period varied from a few days to six weeks. In

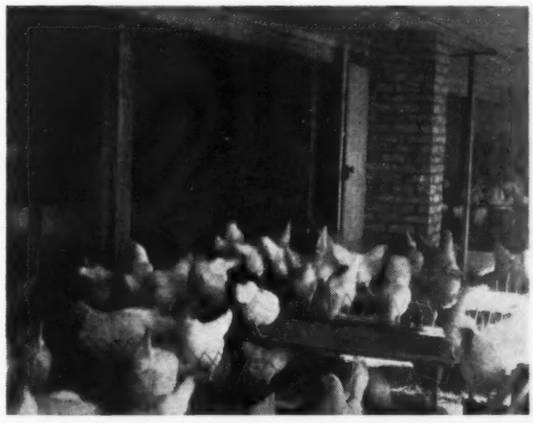


This saw dust insulated, two-story poultry house, is heated in winter with a warm air furnace and ventilated in summer with inswinging windows. Only one ton of wood was used for fuel in the winter of 1935-1936.

the case of McIntosh seven carloads went into storage when the price was low due to heavy marketing of this variety. At the end of from five to six weeks these apples were sold at an advance of from 35 to 40 cents per bushel in market price. This refrigerated and humidified farm storage cellar has been a financial success and has resulted in the placing of high quality apples on the market long after the orchard supply of that particular variety had been exhausted.

Two-story Poultry House. On a general dairy and livestock farm in central Wisconsin, a single-story shed-roof poultry house 14′x50′ was remodeled into a two-story house 26′x70′ in the summer of 1935. The first floor consists of two pens 30 feet long, with a feed room 10 feet wide in the center. Under the rear 16 feet of this feed room a basement or furnace room was provided and a good chimney was built from this room and up through the center of the house. The second floor has two pens, one 30 feet long and the other 40 feet long. On the first floor the stairway to the basement and also up to the second floor was located in the feed room.

Insulation consisted of a six-inch pack of dry sawdust in all side walls and eight inches of the same kind of material in the ceiling of the second floor. The insulation pack is protected from moisture by the following wall construction: Outside, a good grade of water-



Interior view of poultry house.

proof building paper and drop siding were used, while on the inside of studdings and on the ceiling of the second floor this same good grade of waterproof paper and matched lumber were used. Some authorities question this type of wall construction, but we have used it in straw-loft poultry houses for nearly twenty years with excellent results.

Ventilation is provided in summer by opening windows. The top sash is hinged at the top and swings in to admit direct sunlight on the floor, while the lower sash tips in at the top or may be lifted out. Netting on the outside keeps the birds in. The ventilation in winter is a part of an air conditioning arrangement. A warm-air furnace with a fire pot twenty-six inches in diameter was set up in the basement and provided with one warm-air riser to each floor with damper controls. Cold-air return is by way of the stairs, and fresh air is either admitted directly into the furnace room from the outside or allowed to enter through an opened window near the stairway in the feed room, and on mild days windows are opened in the poultry rooms for ventilation, direct sunlight and temperature control. Warm air is exhausted from the east and west ends of the building and from each floor. Insulated outtake flues extend from eighteen inches above the floor to a point three feet above the ridge of the house. These outtake flues require dampers so they can be throttled down in the coldest weather.

About eight hundred and fifty birds were placed in

(*Continued on page 70*)

Forced Air Heating Facts From the Research Residence—

Checking Chimneys

By S. Konzo
Special Research Associate
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IN the preceding issue the measurements involved in the determination of the following items were considered:

I. Furnace Measurements
   a. Heat input to furnace
   b. Heat output at bonnet
   c. Efficiency at bonnet
   d. Heat loss in flue gases
   e. Efficiency of combustion

In this issue the discussion will consider the following items:

II. Chimney Measurements
   a. Available draft in chimney
   b. Setting of balancing draft dampers
   c. Back-draft diverters

Action of Chimney

The function of a chimney is to dispose to the outdoors the products of combustion generated in the furnace. In the case of large power boilers and in the case of certain mechanical draft installations, the products of combustion are expelled from the furnace or boiler by a blower or fan. In the ordinary residential heating system, however, the forces of gravity are utilized in providing air to the furnace and in getting rid of the waste gases. One of the clearest explanations of the action of a chimney is that by Professor A. P. Kratz in a paper entitled, "Use of the Draft Gage for Testing Chimneys in Warm Air Heating Plants" (American Artisan, Vol. 90, No. 26). The following quotation is from the paper:

"First, it should be understood that the whole furnace system, including the chimney, is immersed in the atmosphere, and that the atmosphere exerts a pressure of about 14.5 pounds on every square inch of surface. If there is no fire in the furnace and the chimney is cold, this pressure will be exerted down through the chimney, and the pressure in the combustion chamber will be the same as the pressure of the atmosphere outside; that is, 14.5 pounds per square inch. Consequently, if a glass U-tube partly filled with water is connected into the combustion chamber as shown in Fig. 1, the water will stand at the same level in both legs of the U-tube.

"Now, assume that the draft damper in the ash-pit door and the overdraft damper in the fire door ar both tightly closed, and that there is a fire in the furnace. In this case the gases in the chimney are hot. Since the gases in the chimney are hot, they weigh less than a similar column of air on the outside, and hence they will have a tendency to rise. This tendency to rise will produce a suction through the smoke flue and in the combustion chamber. In other words, the pressure in the combustion chamber will now be less than the pressure of the outside air.

"Under these conditions the pressure of the air outside of the furnace will force the water down in the leg of the U-tube that is open to the air, and up in the other leg until the weight of the liquid in the unbalanced column, represented by the difference in the levels of the water, just balances the difference in pressure between the air outside of the furnace and the gases inside of the combustion chamber. The greater the difference in pressure, the greater will be the difference in the two water levels. This difference in pressure is called the 'draft,' and the height

Fig. 1—Testing Draft in Heating Furnace.

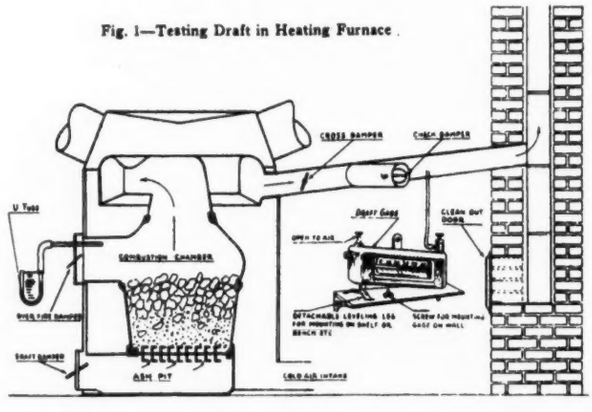


Fig. 1—Testing draft in a heating furnace. (From "Use of Draft Gage for Testing Chimneys in Warm Air Heating Plants," by A. P. Kratz.)

of the unbalanced column of water in the U-tube in inches, or the difference in level in the two legs, is an exact measure of the draft. That is, a draft of 0.1 inch of water means that there is a difference in pressure that will cause a difference in level of 0.1 inch if a U-tube containing water is inserted, as in Fig. 1."

Incidentally, it should be noted that the measurement of static and total pressures in a duct that is used to convey air, is in many respects similar to the measurement of the draft in a chimney carrying hot flue gases. In fact, the same draft gage that is used for measuring draft in a chimney may be adapted to measurements of total and static pressures in a duct system.

Theoretical Draft

The theoretical draft that is available in a given chimney may be calculated from the "chimney formula." (See Bulletin 246, of U. of I. Engineering Experiment Station.)

$$D = 7.64\,H\left(\frac{1}{T_a} - \frac{1}{T_c}\right) \quad \ldots\ldots\ldots (1)$$

in which, D = Theoretical draft, in inches of water,
H = Height of chimney, in feet,
T_a = Absolute temperature on cold side of system,
= 460 + outdoor air temperature in deg. F.
T_c = Absolute temperature on hot side of system,
= 460 + average chimney temperature in deg. F.

The curves plotted in Fig. 2, which are based on this formula, show the theoretical draft that is

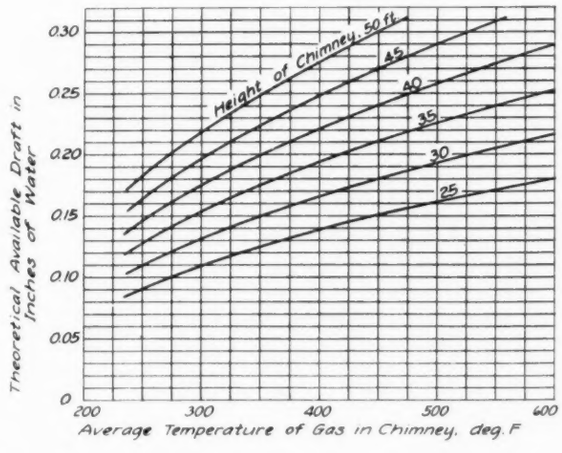


Fig. 2—Theoretical available draft as calculated from chimney formula.

available for various chimney temperatures and for various heights of chimney. In order to estimate the probable draft that would be available in a given installation, it is necessary to estimate the average flue gas temperature in the chimney. Since the flue gases cool considerably from the time that they leave the furnace outlet until the time they pass up the chimney, the average chimney temperature will be considerably below the temperature of the flue gases as measured at the smoke outlet of the furnace.

In this connection the data shown in Fig. 3 (From U. of I. Bulletin 189) is of interest. "Arrows in Fig. 3 indicate the combustion rates necessary to maintain a temperature of 70 deg. F. in the house for zero weather, and the corresponding flue gas temperatures were as follows:

Weather, zero deg. F	Hard coal	Soft coal
Temperature at furnace, deg. F.....	570	760
Temperature at top of chimney, deg. F...	190	250

These values were for average combustion rates of 3.4 and 4.9 lb. of coal burned per sq. ft. of grate

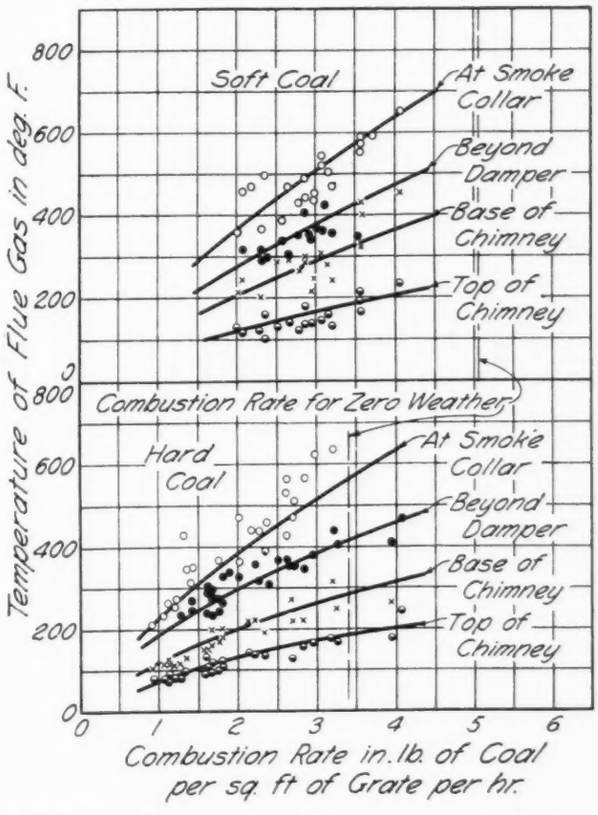


Fig. 3—Flue gas temperatures for hard and soft coal. (From U. of I. Bulletin No. 189)

per hour for hard and soft coals respectively. The combustion rates that were maintained during the periods when the draft door was open were considerably higher, and hence the flue gas temperatures during such periods of increased draft were probably also much higher than the values given. For the general case, an average chimney temperature of about 450 deg. F. for hard coal and 550 deg. F. for soft coal would probably be suitable for use in equation 1 and Fig. 2.

Example 1

Given a chimney 35 ft. high, what is the theoretical available draft? Assume that the average flue

(*Continued on page 74*)

DESIGN C.F.M. 1243 DESIGN REG. TEMP. 141 DESIGN STATIC .06

WARM AIR LAYOUT

29	STACK NUMBER	1	2	3	4	5	6	7	8	9	10	11	12		
30	ROOM USE	KITCHEN	½ LIVING	BED #1	LAUNDRY	HALL UP	BATH	BED #3	BED #2	½ LIVING	REC	HALL	DINING		
31	B.T.U.	8970	6240	4780	9990	6720	4960	7750	7570	6240	14370	3770	8890		
32	ACTUAL LENGTH	12	11	20	5	18	18	18	23	11	9	10	9		
33	EQUIVALENT LENGTH	37	36	65	10	58	58	63	48	36	24	35	24		
34	REGISTER TEMPERATURE - CORRECTED	142	142	140	144	141	141	141	139	142	143	143	143		
35	FACTOR Q	.0136	.0136	.014	.0133	.0138	.0138	.0138	.0142	.0136	.0135	.0135	.0135		
36	C.F.M. - CORRECTED	122	85	67	133	93	69	107	108	85	193	51	120		
37	ROUND PIPE SIZE - BEFORE CORRECTION	7.4	6.4	5.9	7.6	6.7	5.9	7.0	7.0	6.4	8.7	5.3	7.3		
38	CORRECTION FACTOR - TABLE 9	.835	.835	.93	.63	.905	.905	.93	.87	.835	.785	.835	.785		
39	ROUND PIPE SIZE - CORRECTED	6.2	5.4	5.5	4.8	6.1	5.4	6.5	6.1	5.4	6.9	4.5	5.8		
40	RISER SIZE	10x3½	10x3½	10x3½		10x3½	10x3½	12x3½	10x3½	10x3½		10x3½	10x3½		
41	REGISTER VELOCITY	300	300	300		300	300	300	300	300	500	300	300		
42	REGISTER SIZE	10x8	10x6	10x5		10x8	10x6	10x8	10x8	10x6	12x8	10x4	10x8		

RETURN AIR LAYOUT

43	STACK NUMBER	R-1	R-6	R-2	R-5	REC	R-4	R-3							
44	ROOM USE	HALL&LIV.	BED #1	LIVING	BED #2		BED #3	DIN.&KIT.							
45	EQUIVALENT LENGTH	60	70	50	60	40	50	40							
46	C.F.M. - CORECTED	247	67	189	108	193	107	180							
47	ROUND PIPE SIZE - BEFORE CORRECTION	9.5	5.9	8.6	7	8.7	7	8.5							
48	CORRECTION FACTOR - TABLE 9	.905	.93	.87	.905	.835	.87	.835							
49	ROUND PIPE SIZE - CORRECTED	8.6	5.5	7.5	6.4	7.3	6.1	7.1							
50	STACK SIZE	2-10x3½	10x3½	14x3½	12x3½	14x3½	10x3½	14x3½							
51	R.A. REGISTER OR GRILLE VELOCITY	24x4	10x4	14x5	12x4	14x6	10x5	14x5							
52	R.A. REGISTER OR GRILLE SIZE	500	500	500	500	500	500	500							

DUCT LAYOUT

	STACK NO.	BRANCH TRUNK C.F.M.	MAIN TRUNK C.F.M.	RD. PIPE BEFORE CORR.	CORR. FACTOR	RD. PIPE CORR.	RECT. EQUIV	STACK NO.	BRANCH TRUNK C.F.M.	MAIN TRUNK C.F.M.	RD. PIPE BEFORE CORR.	CORR. FACTOR	RD. PIPE CORR.	RECT. EQUIV.	STACK NO.	BRANCH TRUNK C.F.M.	MAIN TRUNK C.F.M.	RD. PIPE BEFORE CORR.	CORR. FACTOR	RD. PIPE CORR.	RECT. EQUIV.
53	1		122	7.4	.835	6.2	5 x 8	8		108	7.0	.87	6.1	4 x 8	R-1		247	9.5	.905	8.6	8 x 8
54	2		85	6.4	.835	5.4	4 x 8	9		85	6.4	.835	5.4	4 x 8	R-6		67	5.9	.93	5.5	4 x 8
55			207	8.9	.835	7.5	6 x 8			193	8.9	.87	7.8	7 x 8			314	10.5	.93	9.8	10 x 8
56	3		67	5.9	.93	5.5	4 x 8	10		193	8.7	.785	6.9	5 x 8	R-2	189		8.6	.87	7.5	6 x 8
57			274	9.9	.93	9.2	9 x 8			386	11.3	.87	9.9	11 x 8	R-5	108		7.0	.905	6.4	5 x 8
58	4		133	7.6	.63	4.8	4 x 8	11	51		5.3	.835	4.5	4 x 8			297	10.3	.905	9.4	10 x 8
59			407	11.5	.93	10.7	12 x 8	12	120		7.3	.785	5.8	4 x 8			611	13.4	.93	12.5	17 x 8
60	5		93	6.7	.905	6.1	4 x 8			171	8.4	.835	7.1	6 x 8	REC		193	8.7	.835	7.3	6 x 8
61			500	12.4	.93	11.6	15 x 8			557	12.9	.87	11.3	14 x 8			804	14.8	.93	13.8	21 x 8
62	7	107		7.0	.93	6.5	5 x 8								R-3	180		8.5	.835	7.1	6 x 8
63	6	69		5.9	.905	5.4	4 x 8								R-4	107		7.0	.87	6.1	4 x 8
64			176	8.5	.93	7.9	7 x 8										287	10.1	.87	8.8	8 x 8
65			676	13.9	.93	13.0	18 x 8										1091	16.5	.93	15.4	26 x 8

The New Technical Code

IN the discussion of the New Technical Code in previous articles we have determined the cubic contents of all rooms; the square feet of glass, walls, floors, ceilings; selected the heat loss coefficient for each material; and converted these factors into Btu loss for each room. Further, we have selected an average register temperature and determined the cfm for this register temperature.

While these calculations were underway we probably have sized up each room and tentatively placed our registers and returns. At the same time we should have decided whether any rooms require more than one register.

We now turn the data sheet over and find we are ready to lay out our duct system and size the mains, branches, risers, registers. Since most contractors will have their own ideas about register placement we will not discuss the merits of the locations shown on the plans except to point out that when we drop our risers and gather our branches together we have a short, simple, two-trunk distribution system. All registers are on inside walls, returns are on outside walls; there are no extraordinarily long branches; and we have to run through only three basement partitions. (Fig. 3).

For convenience we should here number each register and each return and to simplify reference, we start at the end of one run with number one. In our layout this is the register to the kitchen and in this main we have registers 1 (kitchen), 2 (one end of living room), 3 (bedroom number 1), 4 (laundry), 5 (second floor hall), 6 (bath), 7 (bedroom number 3). On the other main we have registers 8 (bedroom number 2), 9 (other end of living room), 10 (recreation room), 11 (first floor hall), 12 (dining room).

These numbers are placed across as item 29 on the data sheet and as item 30 we designate the room each of these registers serves.

Then from item 25 on the other side of the data

sheet we enter the Btu. loss (net Btu. loss) for each room. For the living room where we have decided to use two registers we divide the net Btu. loss in item 25 (12,480) by 2 to get 6,240 for registers 2 and 9.

In item 32 (actual length) we scale from the blue prints or take from our measurements made on the job the actual lengths of each run from *bonnet to register*. The code says—(Article 6, Section 2, Item

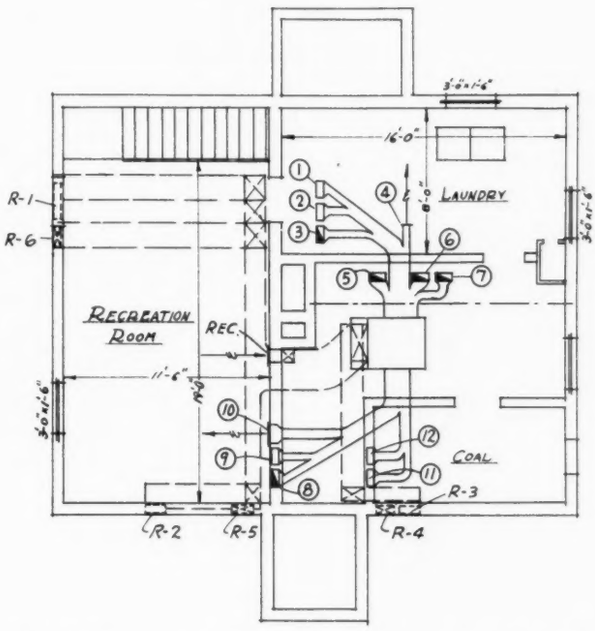


Fig. 3—Basement plan with branches numbered for data sheet. See previous issues for floor plans.

b)—"The actual length of a rectangular or round warm air or return air run is the linear feet of pipe or duct between the register and the furnace. See Diagrams A and B, Fig. 2."

Note that in Fig. 2 each turn of pipe is measured *from center line to center line of each turn.* It is impossible to show measurements on our small floor plans because these plans are not to scale; readers will, therefore, have to take our word for the measurements shown in Item 32.

Item 33 may introduce a new thought to readers not familiar with design according to the equal friction method. In the equal friction method each pipe is designed to a preselected friction so in each run we will have lengths of straight pipe and bends or angles or transitions and each such fitting presents to the air stream a friction equal to so many feet of straight pipe. Therefore, to know what the friction of any pipe will be, we must convert turns, elbows, transitions into straight pipe. This we do in item 33.

Concerning Item 33 the code says—"The equivalent length of a round or rectangular pipe is the total actual length, plus the equivalent lengths in straight pipe or duct, of all turns.

"Assume all 90-degree turns equal to 10 feet of straight pipe or duct, and 45-degree turns and register boxes equal to 5 feet of straight pipe or duct. See Table 10 if more accuracy is desired.

"Referring to Fig. 2, diagrams A and B—add equivalent length of register box (5 ft.) to turns at E (90°, 10 ft.), D (90°, 10 ft.), A (90°, 10 ft.) W (45°, 5 ft.), X (45°, 5 ft.), Y (90°, 10 ft.), Z (90°, 10 ft.) and turn at bonnet (90°, 10 ft.) equalling 75 feet. Add to this 75 feet the measured actual length of the run (42 feet) and get the total equivalent length of the run from register to bonnet 75 feet plus 42 feet equals 117 feet."

It is confusing at first to allot to each fitting an equivalent length of straight pipe and most often the 5 feet for the register box and the 10 feet at the takeoff at the bonnet are forgotten. The bonnet 10 feet should be included even *when the pipe comes off the bonnet horizontally* and is then an "entry loss."

Item 33 should here be compared to item 32. For instance, the actual length of pipe for register 5 is 18 feet, but because of elbows, turns, crossovers, etc., the

Figure 2

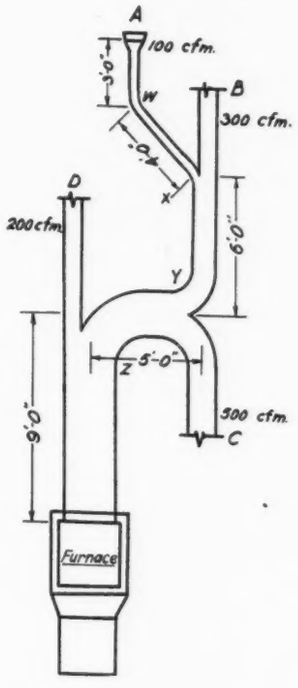


Diagram A

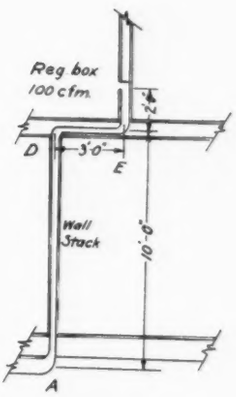


Diagram B

equivalent length is 58 feet. The bath shows the same increase. Bedroom 3 is still worse showing 63 feet equivalent length for 18 feet of actual length.

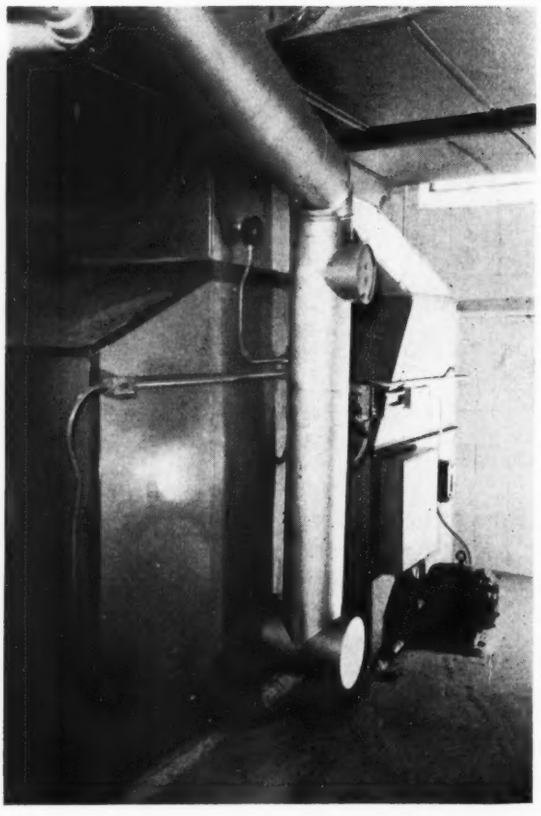
This brings out the point that the resistance in a run of pipe from bonnet to register is not so much a function of the *actual length* as a function of *equivalent length* when the resistance of turns, elbows, fittings have been added. We suggest that readers take their last plan and go through each run and see how much resistance there is in the various runs in terms of friction. Some run which may not deliver its quota of air then becomes self explanatory.

It should be pointed out here that if all pipes are converted into equivalent length and sized for equal friction, each pipe should deliver the amount of air required without moving any damper in the whole system.

(*Continued on page* 80)

Heating a 325,000 Btu House

The exterior above shows the front entrance and stair tower. The furnace room is well filled with apparatus (oil fired heater, blower filter unit with outside motor) and a goodly quantity of large ducts. The smoke pipe comes off the secondary air heater. The lower photograph shows two bathrooms with high registers.

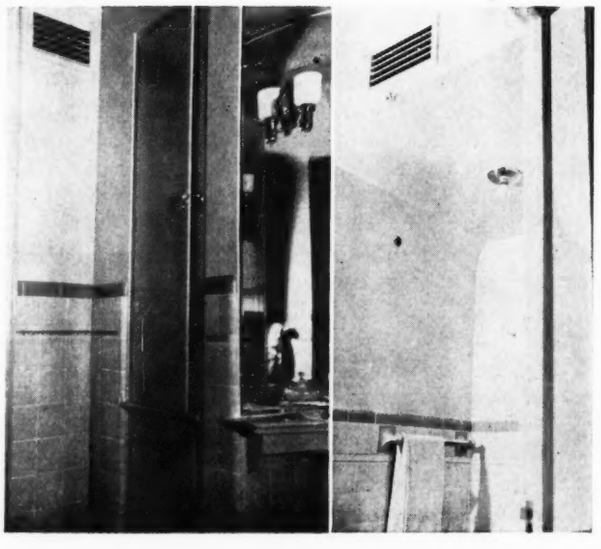


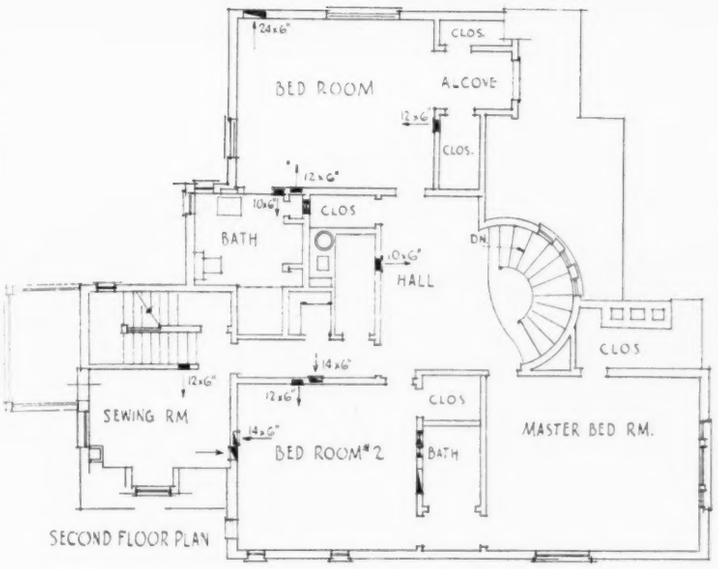
On the facing page are the three floor plans in order. Note the large area remote from the furnace. Ducts are plastered in except in the laundry, but the temperature drop is considerable. The location of registers and returns with respect to cold wall areas was taken into account wherever possible.

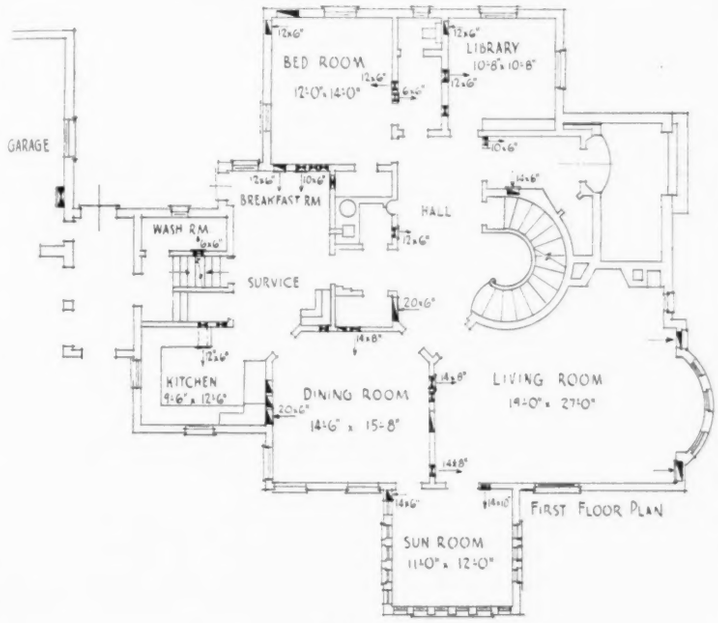
A FEW years ago when forced warm air heating opened the way into the large home field, the industry rubbed its hands and declared that at last many of the installation problems due to small, cramped quarters would be eliminated. Even more satisfaction was aroused as contractors visualized the large *new* house field where an architect would surely make every possible allowance for a good heating system.

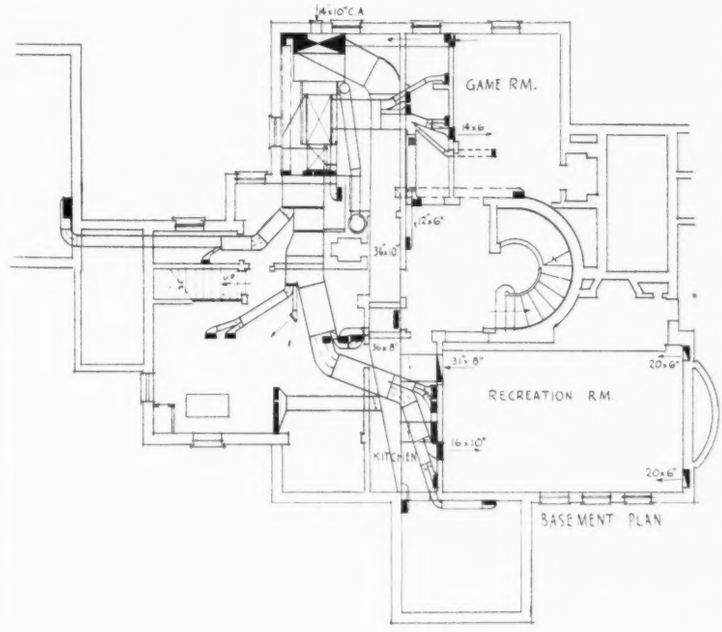
This industry satisfaction was short lived. Much equipment was sold by pointing out the additional basement room available with furnaces located off center and with automatic firing removing the fuel room. Owners and architects took the industry at its word and "cut up" basements quickly became the order of the day.

Today, in place of the large open basements of ten years ago, the area below grade has become as many-roomed as floors above and furnace rooms have been









pushed into corners and even outside the foundation. Owners and architects instead of expressing satisfaction over this additional space have cried for smaller furnace rooms, greater head room, fewer runs of ducts and complete concealment. In place of the easy sailing anticipated, contractors are frantic with the extra planning and expense involved in getting equipment into smaller and smaller spaces.

The photographs and drawings show a house which began as an ideal situation, but ended with unusual problems of installation and design just because all the problems mentioned above came into the picture. For example, the basement plan shows the furnace located as far from the area of greatest heat loss as possible. The recreation room in the basement, the living room, sun room, dining room on the first floor and the master bed room and one other on the second floor are all in the far corner from the furnace. This group of rooms not only presents the greatest heat loss area, but are the critical rooms by which the system is judged. Also, fluctuations in temperature, drafts, cold areas which might "get by" in service quarters will not be tolerated in the critical area.

The house has a heat loss of 325,000 Btu. A register air temperature of 125 degrees was selected with an air change of six per hour. The Bertossa Power Heater has a capacity with oil of 475,000 Btu., which is generous, while the Brundage blower has a capacity of 5,500 cfm. to meet the requirement of 4,200 cfm.

Of considerable interest is the velocity through the mains. Due to the fact that so large a quantity of air must be passed through the longest ducts and because the owner insists on shallow ducts for head room and because structural members restrict the spaces through which ducts can be run, velocities in the mains was stepped up to 1,200 fpm. This high main velocity is dropped through risers and in some branches and is further dropped to 450 fpm at the registers. These registers are all in the side wall above the breathing level.

Some of the interesting details of the design are shown in the plans. There is, for example, a circular stair well running open from basement to second floor ceiling. One return on the first floor is the only air exit for this well. Warm air is supplied at the first and second floor halls with just enough air for the halls proper, thus leaving the stair well to be heated by gravity air flow through the space. Supply registers are located on inside walls and in severely exposed rooms these supply registers where possible are located to sweep the air across cold glass or wall areas.

There is a generous number of return grilles—each major room having at least one return and the larger rooms two returns. Halls on both floors have supply and return, as have the recreation and game room in the basement.

Additional interesting points are shown in the photographs. All registers are horizontal bar types without vertical bars and have easily adjustable blades so that the air may be shut off or the direction of the air throw may be changed higher or lower. All registers are specially sealed into the stack heads since most walls in the house are painted and any streaking will be noticeable immediately.

Registers in bath rooms are placed as close to the ceiling as possible with the air turned down and the velocity reduced below the house average. Registers in principle rooms are several inches below the ceiling so that there will be no scrubbing effect even when the owner opens the face up full.

The photograph of the furnace and blower and the basement plan show how restricted is the heater room. There is just space to locate the apparatus and provide an aisle for inspection, yet into this small room a great many ducts had to be brought together.

The entire house is controlled from one thermostat in the first floor hall. One thermostat was decided upon because all first and second floor main rooms open directly into the stair well and it was felt that air circulation throughout these spaces should be complete and uniform.

Control Operation

In view of the fact that there are no zones in the house, in other words the entire system is operated as one heating zone, the controls are arranged so that the first floor thermostat starts the burner when heat is needed and stops the burner when the thermostat is satisfied.

A fan switch in the bonnet of the furnace starts the blower when the bonnet temperature reaches a setting of approximately 140 degrees. The blower can run until the bonnet temperature drops through a 25-degree differential or to 115 degrees.

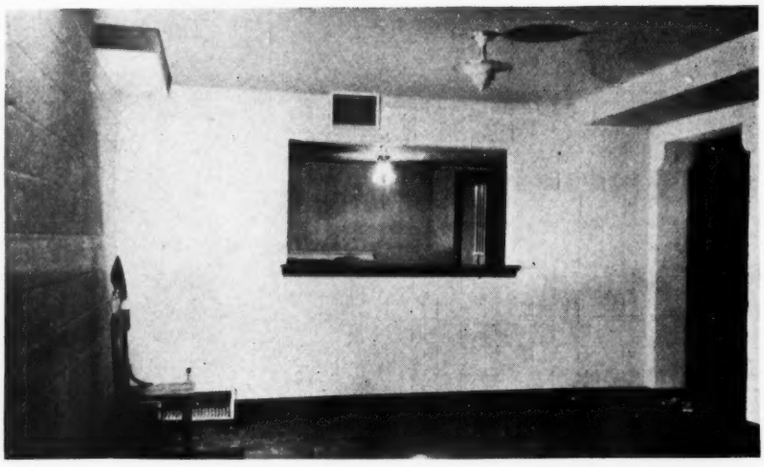
In order that the house can be uniformly heated with this control system and to compensate for differences in exposure, all ducts were designed to equal friction. Theoretically, if heat losses are as figured, each register will deliver its required quota of air without changing any branch pipe dampers from the full open position.

The garage is heated from a two-branch run. Temperature to be maintained in the garage is 55 degrees.

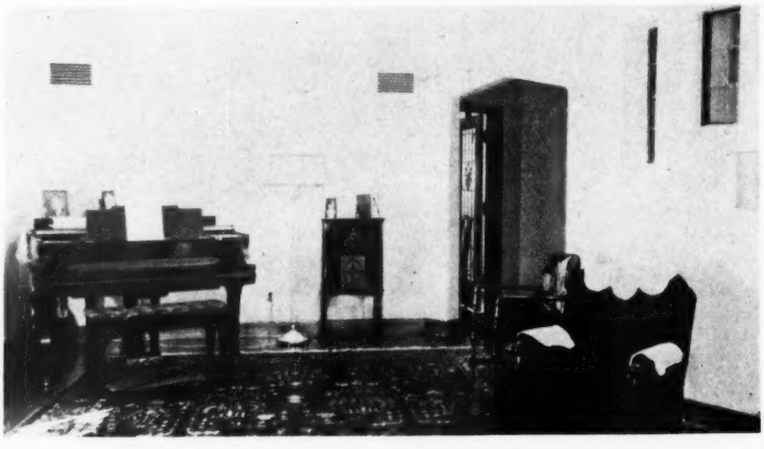
Humidification and air washing is supplied by a series of spray nozzles within the conditioner cabinet. Water is sprayed over a series of eliminator plates. Permanent air filters are in place ahead of the plates.

Water is admitted to the spray through a valve controlled by a humidistat placed alongside the thermostat in the first floor hall.

From the architect's plans a rough layout of the system was made. Then the job was roughed in and the actual location of all ducts was determined from measurements made in the house. All metal work was fabricated in sections ready to hang and delivered by truck. Sections of incorrect measurement were thereby eliminated and cutting and fitting was reduced to the minimum. Locking dampers are located in every branch pipe with a quadrant exposed in the ceiling for adjustment.



Ducts through the basement recreation room are plastered in. The supply is in the side wall with the return in the baseboard. In the laundry (center photograph) ducts are exposed. Note the laundry chute which just had to come in the middle of the largest duct in the house. Below is the living room with two supplies. The windows at the right are in the stair well.



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G-E MOTORS PASS ALL TESTS

070-210

GENERAL ELECTRIC

Air Conditioning On Wisconsin Farms

(*Continued from page* 61)

this house in the fall of 1935, and from December first on through the winter sixty percent production was maintained. The number of birds in the flock was reduced by careful culling so five hundred were left by the middle of June, 1936. This was a good production record considering the severe winter of 1935-1936.

Because of thorough insulation very little fuel was required. Less than a ton of wood was used in the 1935-1936 winter. The humidity was well controlled by the regulation of windows, outtake flues and furnace heat. In fact, in the most severe weather the oat-straw litter was changed at three-week intervals and was not wet or matted then.

The temperature was maintained between 35 and 40 degrees day and night for weeks at a time, and the birds seemed to be perfectly comfortable. The furnace fire was started shortly after sundown and was allowed to go out about the time the morning lights went on except in the very coldest weather. After a cold spell it was frequently necessary to open the windows on a mild sunny day to prevent excessive temperature changes.

The summer temperature in this house was surprisingly low through the hottest part of the day. A ten-degree temperature difference between outside and inside, with the inside temperature being lowest, was not uncommon. Cool south winds helped to make the house comfortable in warm weather.

This poultry house was built for $1,500 cash and with some home-grown timber. The owner figures that his house has paid for itself during the first season. It is now filled with pullets, and they are starting off on what appears to be another profitable season. He is getting good production, and high feed prices do not bother much because he feeds mostly home-grown grains. The size of poultry house for this farm was carefully determined on the basis of farm management records, but that is another story.

Sheep Barn. Early lambs, frequently called "hot house" lambs, are preferred by many Wisconsin sheep raisers because they are usually more profitable. Growing, feeding and marketing conditions seem to favor these early lambs.

Early lambs usually do well under ordinary housing conditions in dry sheds, even in very cold weather if they are at least a week old before they are exposed to these rigorous housing conditions. For low mortality of early lambs a warm, dry lambing barn must be provided.

On a farm in south central Wisconsin, a sheep barn 30′x64′ was being used for lambing in February, 1935, when an urgent call for help was sent in to the University. Wall fans could not keep the barn dry without lowering the temperature too much, and lambs were being lost at an alarming rate. Some rapid heat loss and humidity calculations indicated that 5—500 watt heating elements would supply enough heat to dry up the barn. A blower was set up and a metal tube six

NONE BETTER — THAN THE
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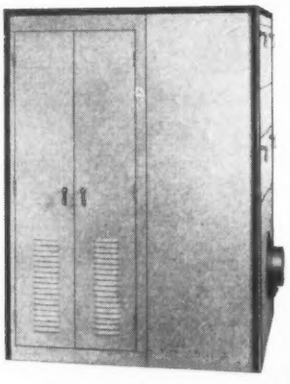
FOR WINTER AIR CONDITIONING



The new Hess Climate Master is modern and complete, including a heavy, welded steel inner body or heat transfer unit, centrifugal blower, air filters, humidifier, and the Hess Automatic Oil Burner with controls.

The outer casing has an attractive, red, baked enamel finish with black trim and rounded corners. The Climate Master is very compact with many refinements and high efficiency of operation.

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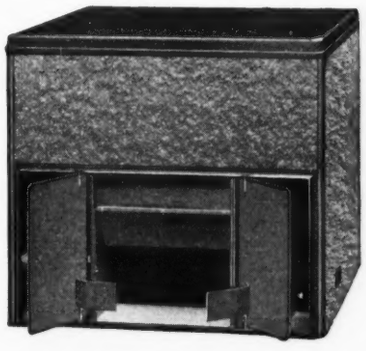

By Means of a 4-Speed Pulley, REX AIR-PAK Offers 4 Different Blower Filter Units all in One Package

With four different speeds available on the REX AIR-PAK you have a choice of four different air velocities—four different blower filter units all in one—to meet every requirement. With but one unit to stock you can take care of the average sized home. That's why heating contractors everywhere are adopting REX AIR-PAK as standard equipment.

Other important features include:

- **Automatic louvres which provide free air delivery when blower is idle.**
- **More filter area than any other unit on the market.**
- **Leveling screws to make it easy to get over different furnace ring heights.**
- **Pivot type motor mounting to keep motor off damp basement floors.**

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Air CONTROLS INC.
DIV. OF
THE CLEVELAND HEATER CO.
1935 West 114th Cleveland, Ohio

SURE PROFIT ON EVERY RECONDITIONING JOB WITH SKUTTLE HUMIDIFIERS

It's the extra sale that puts profit in cleaning and reconditioning work and SKUTTLE HUMIDIFIERS make the extra sale easy because they fit every job and every pocketbook.

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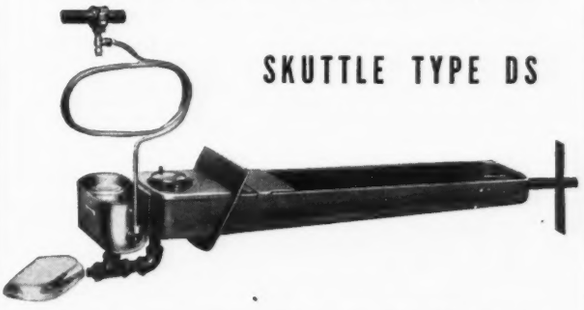
For the lowest priced market Skuttle Watertender fills the bill. Maintains water level in furnace pans automatically. A big seller, and, you double your money on every sale.



SKUTTLE TYPE DS

For the great mass of warm air jobs there are several Skuttle models including that nation-wide best-seller, the Type DS which fits any furnace, is fully automatic and adjustable and pays you double your investment for less than one hour's work.

For boiler-heated homes, the Skuttle Type GF meets the long-existing need for a completely automatic, self-contained humidifier that sells for "around $100" plus installation and pays you a handsome profit.

Skuttle helps you sell—with advertising folders, sales letters, sales manual and suggestions for using them. All Skuttle units packaged singly with easy installation instructions included. Send coupon for catalog and name of nearest distributor.

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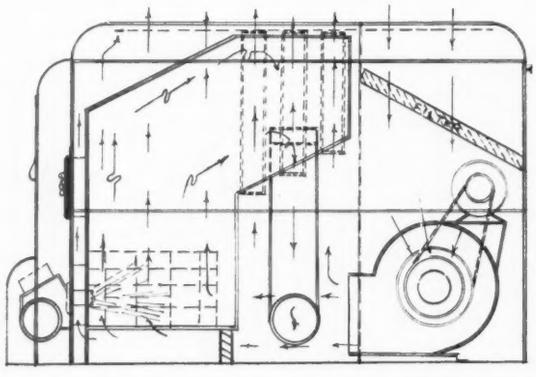
ANNOUNCING

...The New Bertossa Power Heater

Sizes from 50,000 to 2,800,000 Btu.



A furnace built to meet every recommendation for design and every requirement for greater flexibility, output, and efficiency with either hand firing or automatic heat. Designed by pioneers of high output heaters. Featuring the "Superheater"—heat tube chamber providing revolutionary heat transfer and air acceleration characteristics.

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Extra heavy, all-steel construction . . . All welded seams . . . High ratio of prime heating surface . . . Meets recommendations of research laboratories for design and area of heat-combustion chamber, heating surface, air scrubbing, air passages . . . Air passes under full furnace bottom, thereby eliminating heat losses to floor . . . Top of combustion chamber (the hottest surface) is pitched upward to accelerate air flow and obtain intimate, scrubbing action . . . Bottom of superheater chamber is pitched upward to reduce friction and turbulence . . . Power tubes are flush at front side and project at rear side to guide air into tubes . . . Tubes arranged within superheater chamber for easy cleaning through fire door . . . Furnace is tightly cased on back, front and sides to insure rapid air flow and complete scrubbing action . . . Round firing door eliminates dead air space above door . . . Down flow smoke pipe acts as a air pre-heater . . . All air is progressively heated so that leaving air is at highest possible temperature . . . Smoke pipe may be connected at either side; other side acts as a direct cleanout . . . Casing is streamlined; furnished in attractive apple green color with attractive trim . . . Casing is fabricated in panels of double construction with ¾-inch air space insulator . . . Casing can be assembled in a few minutes with a screw driver . . . Full vestibule is supplied for oil and gas burners or as a half door for stoker . . . Bonnet supplied unfinished and designed especially for air flow characteristics of unit . . . Full pressure type blower with belted motor matched to furnace and type of firing . . . Permanent air filter of special material can be cleaned by home owner . . . Filter supplied as single section tightly housed to prevent air bypassing . . . Resistance of unit is ⅛ inch without filters; plus 1/16 inch with clean filters . . . Unit equipped with complete controls . . . Complete engineering service is available.

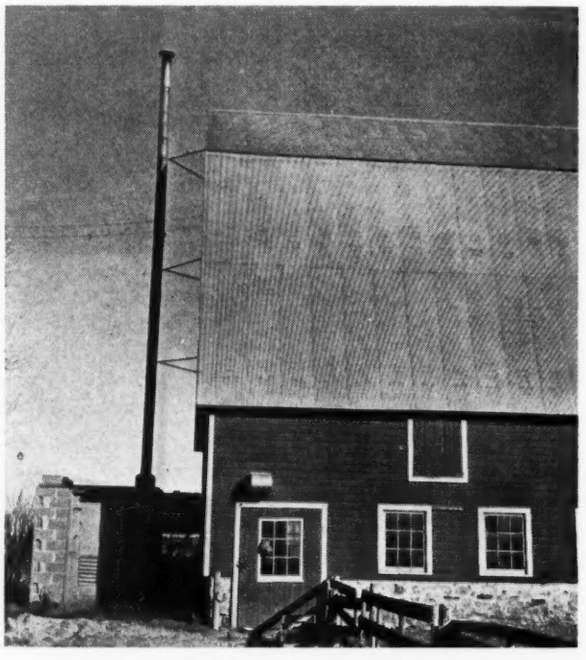
Some jobber and sales representative territory is open.

Write for particulars. Contractors are invited to write for literature and additional information.

BERTOSSA POWER HEATER DIVISION
Jackson and Church, Saginaw, Michigan

inches in diameter and some five feet in length was installed on the discharge end of this fan. In this metal tube the heating elements were mounted, and this heater was set to work the same day the call for help was made. By morning the air had a much lower humidity and the barn was warm enough for the lambs. But few lambs were lost after the heater was installed.

Obviously the cost of operating this heater was high, but it demonstrated the need for artificial heat to the owners. Plans were made and a haydite block furnace room was built outside and at the west end of the barn.



A haydite block attached furnace room houses the furnace and blower for this sheep barn. An exhaust fan removes air for ventilation. The barn s also used for corn drying.

A blower draws outside air over this furnace and forces it into the barn, thus tempering the incoming air for moisture and temperature control. A wall fan at the far end of the barn draws this tempered air the full length of the barn and discharges the air from the barn.

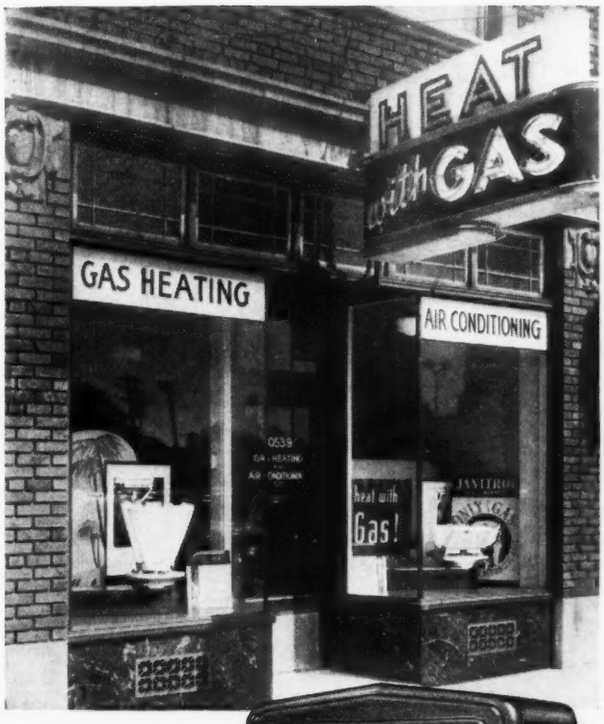
Not only is this barn a success as a lambing barn for several hundred ewes each year. In the fall of 1935 nine hundred bushels of corn were hung on binder-twine hangers from the hay-loft floor joists. The furnace and fans were used to dry what turned out to be a valuable crop of seed corn.

In this combination sheep and corn drying barn the expenditure of a small amount of money has resulted in successful and profitable farm operations. The small fuel and electric energy cost is most insignificant on the annual operating statement, yet its effect on income is most gratifying.

Other Uses. Scores of Wisconsin farms now have seed corn driers using furnaces and blowers for air conditioning and circulation through bins of corn.

Plans are now being made for an air conditioned hog house on the University farm at Madison. By having temperature and humidity control and forced-air cir-

(*Continued on page* 86)



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HUMIDIFIER VALVES MEAN AUTOMATIC CONTROL

You can get the famous M-VB Humidifier Valve in four different numbers—for any type of warm-air furnace water-pan. No. 210, installed through pan-cover, float position set. No. 215, installed through pan-cover, float position adjustable. No. 220, installed through side of pan, float position set. No. 225, installed through side of pan with float position adjustable. *Any one of these can be installed in half an hour—without dropping the fire.*

All four numbers control humidity *automatically*, accurately, without attention. Can't corrode or stick, because all moving parts are above the water-line. And there is famous M-VB quality in all of them. You can be sure of an installation that will add to your good reputation.

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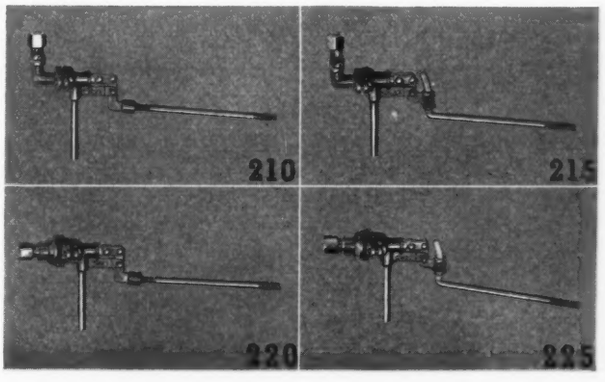

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Easier to Install — Less Service

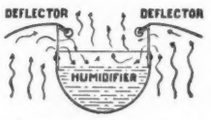
The No. 9
Zephyr Humidifier

1. Water Feeder is away from the heat of the furnace to avoid corrosion.

2. Water Feeder may be raised or lowered at will to change water level in humidifier.

3. Capacity of humidifier may be reduced (to prevent over-saturation in zero weather) by raising patented self locking overflow.

4. Patented Wings plane heated air over the water surface. Practically doubles capacity.



5. Wings are hinged so that humidifier may be installed or removed with ease.

6. The pan is stamped in one piece from genuine Naval sheet Bronze.

7. Naval Bronze is 10 times more efficient in heat transmission than cast iron or steel of the same thickness.

8. The ZEPHYR is equipped with patented adjustable hood and overflow plates to conform with the slope of the furnace bonnet.

9. Comes complete with Saddle Valve and copper water supply pipe.

10. Made in 26" and 36" lengths.

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Please specify which size is desired. Send in Your Order Today. And ask for FREE CATALOG No. A-10 showing other types of Humidifiers and Feed Valves.

MAID-O-MIST Inc.
AUTOMATIC HUMIDIFIERS
180 N. WACKER DRIVE CHICAGO, ILL.

Konzo Chimneys

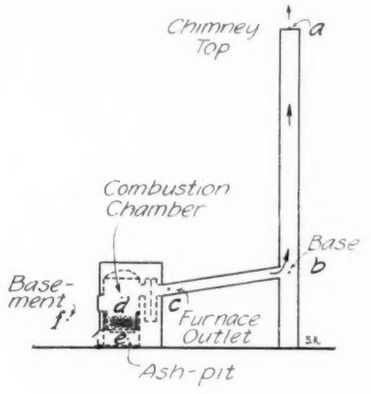
(*Continued from page 63*)

gas temperature when burning soft coal is 550 deg. F.

Read up on the 550 ordinate in Fig. 2 until the inter-section with 35 is reached. The draft, as read on the left hand scale, is 0.24 in.

Example 2

Suppose that an outside chimney is used and the flue gases cool off to a greater extent in the chimney than in the case of an inside chimney. Assume that the average flue gas temperature is 450 deg. F. in this case. The theoretical draft for a 35 ft. chimney would be 0.21 in. Incidentally, it is of interest to note that in the case of an inside chimney, the heat that is lost from the chimney surfaces enters the house and hence is not entirely wasted. However, in the case of the outside chimney, the heat that passes through the portion of the chimney that is exposed directly to the out-



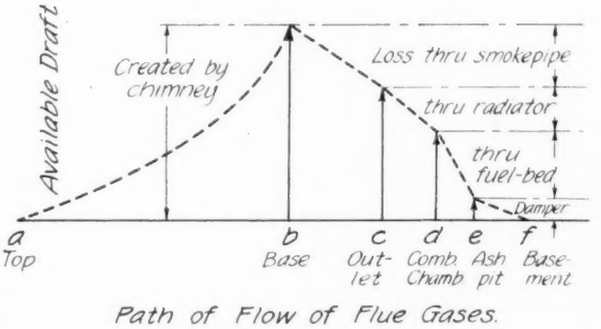


Fig. 4—Diagram showing draft relationships in various parts of chimney and furnace.

doors is lost and is not available for heating the house.

Draft Relationships

In Fig. 4 is shown a diagrammatic sketch of the draft that is available in different parts of the chimney, the smokepipe, and the furnace. The diagram

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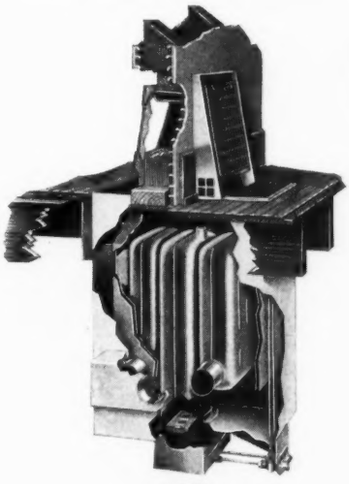
The Payne Duplex Register Furnace is one of the most adaptable units ever built. It has ALL the answers to prospects' heating questions.

It will heat one room. It will heat two rooms. It will heat upstairs as well as downstairs. And it operates with outstanding efficiency and economy.

The Payne Duplex is easy to install. Requires no basement and occupies no floor space. Write for full information.



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An improved re-circulating type furnace. New streamlined construction gives maximum efficiency.

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Aerofin Corporation announces the acquisition of enlarged manufacturing facilities at Syracuse, New York, from which point we shall continue to serve our customers with light-weight, standardized heat exchange surface for heating and cooling. The general sales and executive offices of Aerofin Corporation are now located in the above named city.

This move is in line with an expansion program growing out of the increased demand for Aerofin equipment and reflects the confidence imposed in Aerofin by consulting engineers, architects, heating and refrigeration contractors throughout the country. Aerofin has recently established new branch sales and engineering offices at Dallas and Atlanta, making a total of six strategically located points from which experienced engineering service and technical assistance is available.

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in the upper part of Fig. 4 shows the stations which are of particular interest, while the graph in the lower part of Fig. 4 shows the relative magnitude of the available draft at these various stations. It may be noted that at the top of the chimney the available draft is zero and only a velocity pressure exists. The available draft increases and attains a maximum value at the base of the chimney. This available draft, which has been created by the chimney is the motivating pressure that enables the flue gases to overcome the resistance that is imposed successively by the ash-pit damper, the fuel-bed, the radiator, the smoke-collar, the smoke-pipe, and the entry into the chimney.

The discussion by Professor A. P. Kratz, as given in the paper previously cited is of interest in this connection:

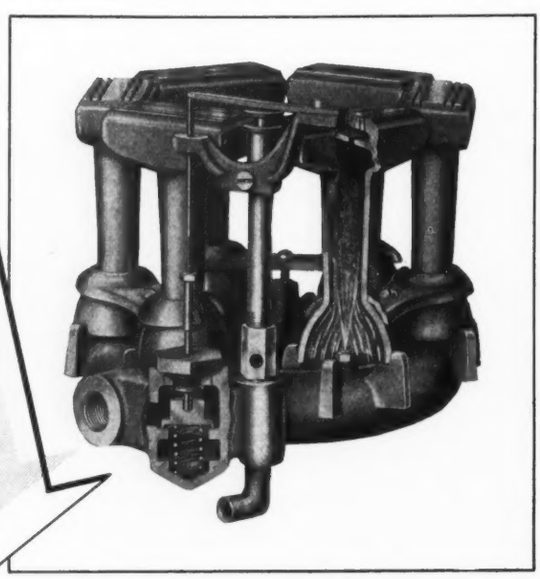
"Practical experience has proven that for the average fuel bed under average conditions it requires a difference of pressure or draft between the ash-pit and combustion chamber of approximately 0.01 inch of water to burn 1 pound of coal per square foot of grate surface per hour. Most furnace ratings are based on a combustion rate of about 7 pounds of coal per sq. ft. of grate surface per hour. Therefore, a pressure difference of about 0.07 in. of water is required between ash-pit and combustion chamber.

Since the draft damper in the ash-pit door, even when open, offers some resistance, and more if partly closed, the draft over the fire in the combustion chamber must be greater than 0.07 in. of water in order to produce the required 0.07 in. of water pressure difference between ash-pit and combustion chamber. Furthermore, there is also some resistance between the combustion chamber and the smoke thimble at the chimney, because of friction in the radiator and smoke-pipe. Therefore, in order to obtain the necessary 0.07 in. of water draft between ash-pit and combustion chamber, the chimney must be able to produce considerably more than this at the smoke thimble. While it is customary practice to base the design of a plant on a combustion rate of 7 lb. per sq. ft. of grate per hr. in severe weather, it is desirable to have reserve capacity in excess of this in order to take care of warming-up periods.

"Taking all things into consideration, experience has proved that a house chimney, in order to be entirely satisfactory, **should be able to produce a draft of about 0.16 in. of water at the smoke thimble** with a good fire in the furnace, and with the check damper closed and the draft damper in the ash-pit door open. Possibly the draft gage reading at the smoke thimble may be as low as 0.12 in. of water before condemning a chimney, but this lower figure is somewhat open to question."

It may be observed that in the case of gas-fired and oil-fired furnaces there is no pressure loss through the fuel bed, as there is in the case of coal-fired furnaces. Consequently, the draft required at the smoke thimble for gas-fired and oil-

ONLY Pacific makes a gas heating appliance for every need



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It consists of several individual burner units, each with its own gas and air intake. There are no adjustable air mixers — each unit is permanently adjusted at the factory for perfect combustion. In repeated tests the Multi-Tubular Burner delivers 10% to 15% more heat for the same amount of fuel. Yet Pacific Furnaces, with all their efficiency and safety features, cost no more. We have some attractive territories open. Write for Catalog AA-10.

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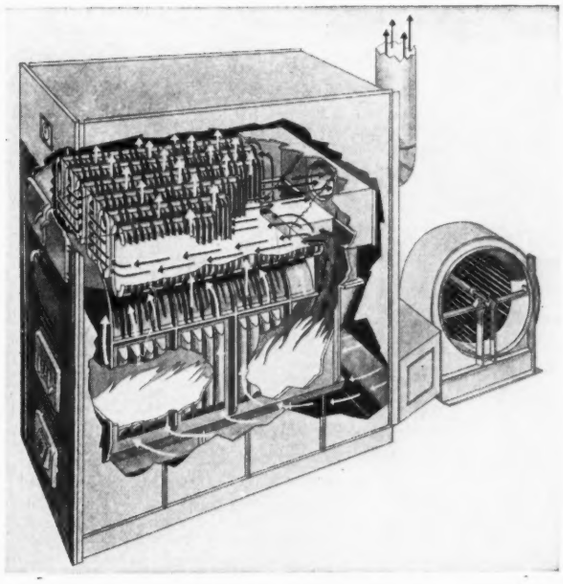

PHYSICAL DATA—LARGE SERIES

Size No.	Dimensions Length	Width	Height	Grate sq. ft.	Heat Surf. sq. ft.	Free Area sq. ft. Min.	Free Area sq. ft. Max.	Wt. Lbs.	Max. Capacity Btu.
7	6'-6"	4'-0"	7'-0"	10.31	260	6.55	10.25	5900	900,000
8	8'-1"	4'-0"	7'-0"	11.91	340	7.73	12.50	7000	1,100,000
9	9'-8"	4'-0"	7'-0"	13.06	430	8.91	14.75	8000	1,300,000
10	11'-3"	4'-0"	7'-0"	14.43	500	15.82	22.62	9300	1,500,000
JUNIOR SERIES									
2	4'-6"	3'-6"	5'-8"	3.9	136	4.7	4.7	3200	350,000
3	6'-0"	3'-6"	5'-8"	6.1	183	5.9	6.9	4800	527,000
4	7'-6"	3'-6"	5'-8"	7.2	230	7.1	9.1	5000	634,000
5	9'-0"	3'-6"	5'-8"	9.3	280	8.3	11.3	6000	800,000

Note: For Automatic Firing Add 10% to Ratings Given.

Burns Any Kind of Fuel

The design of an all cast iron, direct transmission heater, such as the Acme, is not dependent upon the kind of fuel to be used. Any type of fuel may be burned. Suitable grates may be provided so that bituminous, semi-bituminous, anthracite coal, or other solids may be used with equal efficiency. Replacement of grates and linings by proper refractory material permits the use of automatic stokers on oil burning equipment.

Large Combustion Chamber

The Acme Heater provides ample space for the ignition of gases of combustion, regardless of the kind of fuel used. The unusually large combustion chamber, acting as "primary" heating surface, effects a very efficient transfer of heat, because of the great temperature difference between the burning gases inside the chamber and the air passing over the outside surface.

Efficient Radiator Section

Although the heating surface of the combustion chamber is large and efficient, still more heat must be extracted to obtain satisfactory overall efficiency. An inspection of the "phantom view" above will reveal how the gases of combustion enter the rear smoke chamber, flow to the front of the heater, and return again to the smoke-box. It is evident that the gases are held in intimate contact with the heating surface, six times the length of the heater, before they are permitted to escape.

High Ratio of Heating Surface to Grate Area

The radiator tubes are covered with extended surfaces, or fins, typical of those used on indirect heating coils. The long, oval tubes of the radiator provide an exceptionally large heating surface and, when combined with the surface of the combustion chamber, afford a remarkably high ratio of heating surface to grate area.

Balanced Construction

The construction of the Acme Heater provides ample free area and allows proper velocity of the air to be heated. Moreover, this air is brought into direct contact with as much heating surface as possible, resulting in the Acme of Efficiency.

ACME HEATING & VENTILATING CO., Inc.
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Airline Design. Furnished with either vertical or horizontal bars, with or without fixed air deflection. (See illustration).

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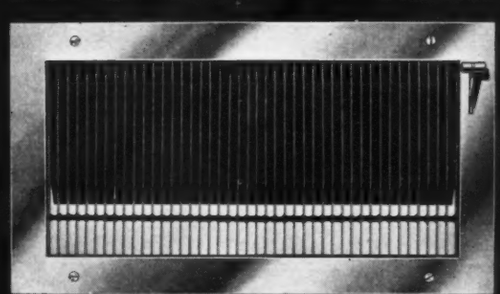

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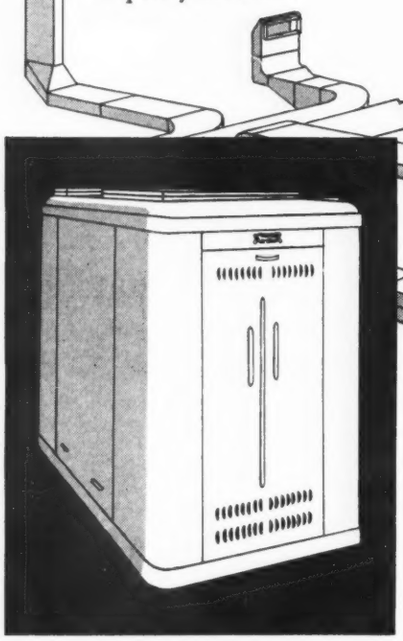
FROM CELLAR TO ATTIC

Your every requirement in warm air heating and winter air conditioning is met in every particular by Moncrief . . . Winter Air Conditioners for Gas, Coal or Oil . . . Cast and Steel Furnaces in all types and sizes . . . Moncrief Blower-Filter Units . . . Miles Junior Air Conditioners . . . Moncrief Automatic Humidifiers.

And All the Way Up
TO THE ATTIC . . .

Everything you need in Single and Double Wall Pipe and other fittings and accessories that go in a warm air heating or air conditioning job—all accurately fitted to go together quickly, easily, securely, made of quality materials.



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fired furnaces is materially less than that required for coal-fired units. In addition, fuel-burning devices that are equipped with forced draft fans, such as oil-burners and mechanical coal stokers, create sufficient air pressure to overcome the pressure losses that accompany the combustion process.

For example, the draft required in the combustion chamber for oil-fired furnaces is approximately 0.02 in. of water, whereas in the case of coal-fired furnaces the draft required in the combustion chamber is approximately 0.10 in. of water. Any check of the available draft in a given chimney should, therefore, take into account the type of fuel to be burned. A hand-fired coal furnace that utilizes a very small sized coal will, for example, require a much better chimney than a furnace that is to be fired with gas or oil. The values shown in Table 1 were obtained from curves plotted in a catalogue published by the Babcock and Wilcox Company and show typical draft relationships for various coals.

Table 1

Draft Loss Between Furnace and Ash-Pit

Values are based on a combustion rate of 7.5 lb. of coal per sq. ft. of grate per hour

Grade of coal	Draft loss
Bituminous (Ill., Ind., and Kan.)	0.06
Bituminous (Ala., Ky., Pa., Tenn.)	0.07
Semi-Bituminous (Md., Pa., Va., W. Va.)	0.075
Anthracite (Pea)	0.11
Anthracite (No. 1 Buckwheat)	0.155
Anthracite (No. 3 Buckwheat)	0.265

Chimney Size Requirements

The recommended minimum chimney size for gravity heating furnaces having leader area ca-

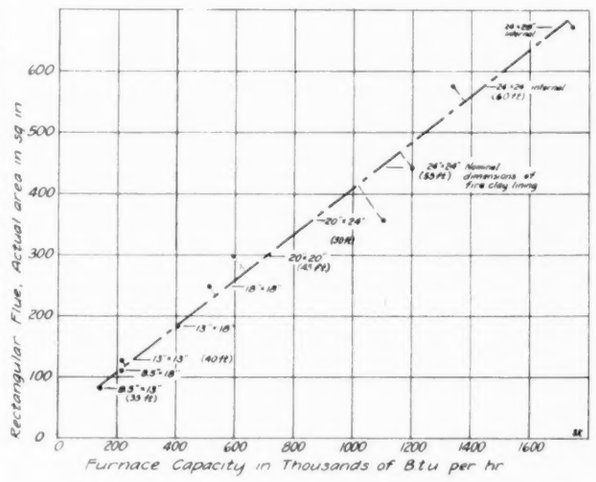

Fig. 5—Approximate relationship between furnace capacity and flue size. (Based on ASHVE Code of Minimum Requirements for the Heating and Ventilating of Buildings, Edition of 1929)

pacities of 790 and 1000 sq. in. is 8½ in. by 13 in. These dimensions are for nominal dimensions of the fire-clay lining. The actual inside dimensions of the fire-clay lining are 7 in. by 11½ in. The inside dimension of an equivalent round flue is 10

(*Continued on page* 92)

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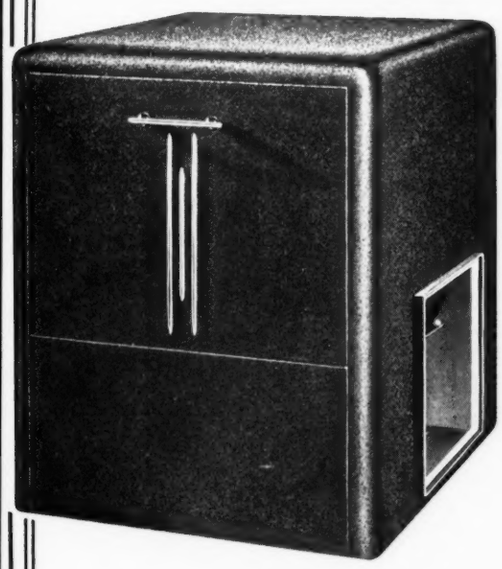
LAU

700 Series Package Unit
Furnace Blower



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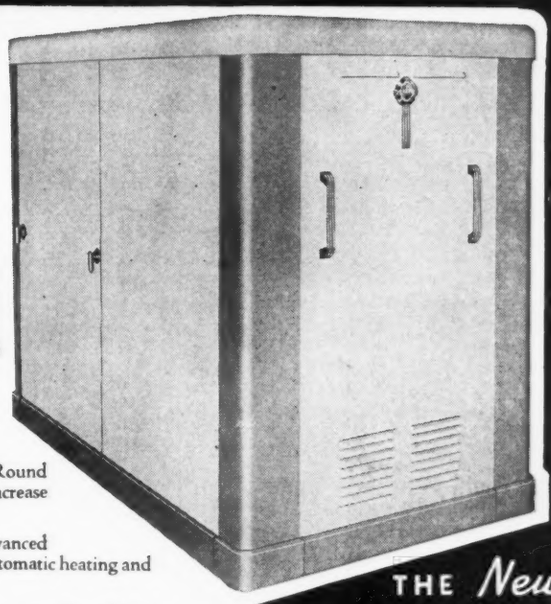

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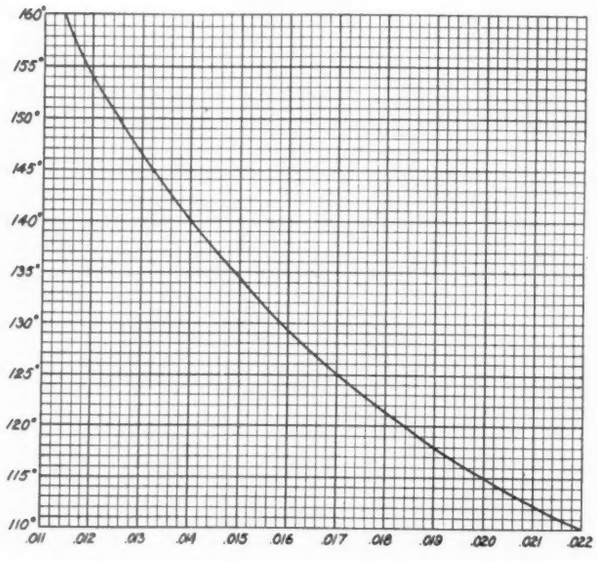
OB-X

Technical Code

(*Continued from page* 65)

Now in item 34 we correct each register temperature so that the temperature drop through pipes because of different distances from the bonnet are taken into account. However, this correction is based upon *actual length of pipe* (Item 32) and *not* upon equivalent length (Item 33). We must remember here that our average register temperature was based upon *a register about average* (or one half) *distance from the bonnet.*

Figure 1
C.F.M. Factors



H = B.T.U. OF ROOM
d = DENSITY OF AIR AT REG. TEMP
t = REGISTER TEMP.
t₁ = RETURN AIR TEMP.
.024 = SPECIFIC HEAT
60 = MIN IN HOUR

C.F.M. AT REG. = $\left(\frac{.024\, d\,(t-t_1)\times 60}{\quad}\right)\times H$

Looking at Item 32 we find that the farthest distant register is 23 feet (register 8) and the closest to the bonnet 5 feet (laundry). The difference then is 23—5 equals 18 feet. Therefore registers 5, 6, 7 are at average distances and there will be no drop or gain so in Item 34 the corrected temperature for 5, 6, 7 is entered at 141 degrees. Reading across in Item 34, register 1 is 12 feet distant so 18—12 is 6 feet and at ¼ of a degree drop or rise per foot register 1 will be 6/4 or 1½ degrees higher than average temperature or we say 142 degrees. Register 2 is the same.

Register 3 is 20 feet from the bonnet so we will have 20—18 equals 2 feet or one-half degree loss. We call it 1 degree loss or 140 degrees. The laundry, register 4 is our closest register—5 feet—so 18—5 equals 13 feet @ ¼-deg. drop or increase per foot equals 13/4 or 3 degrees so the temperature will be a plus 3 degrees or 144 degrees. Other registers are figured similarly.

Item 33 can be worked a different way. If our average register temperature is 141 degrees and the average register is 18 feet from the bonnet our bonnet temperature should be ¼ of a degree higher for each foot or 18/4 equals 4½ degrees. Adding 4½ degrees

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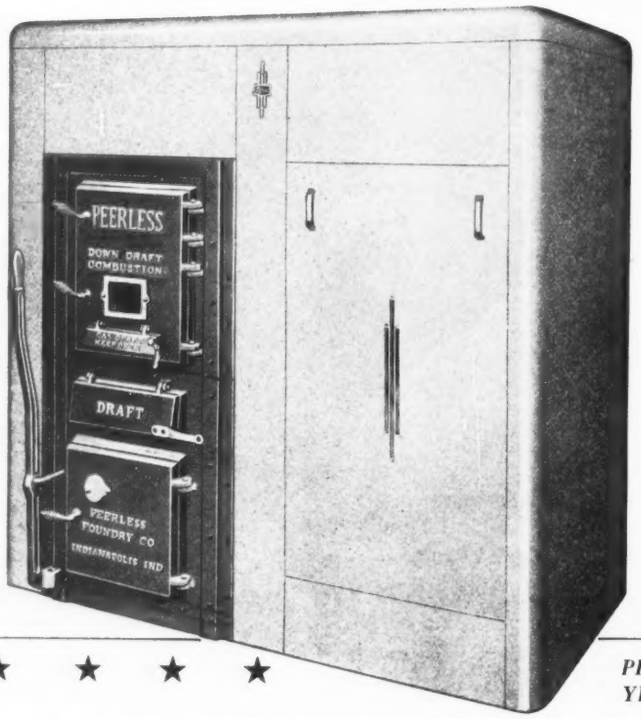

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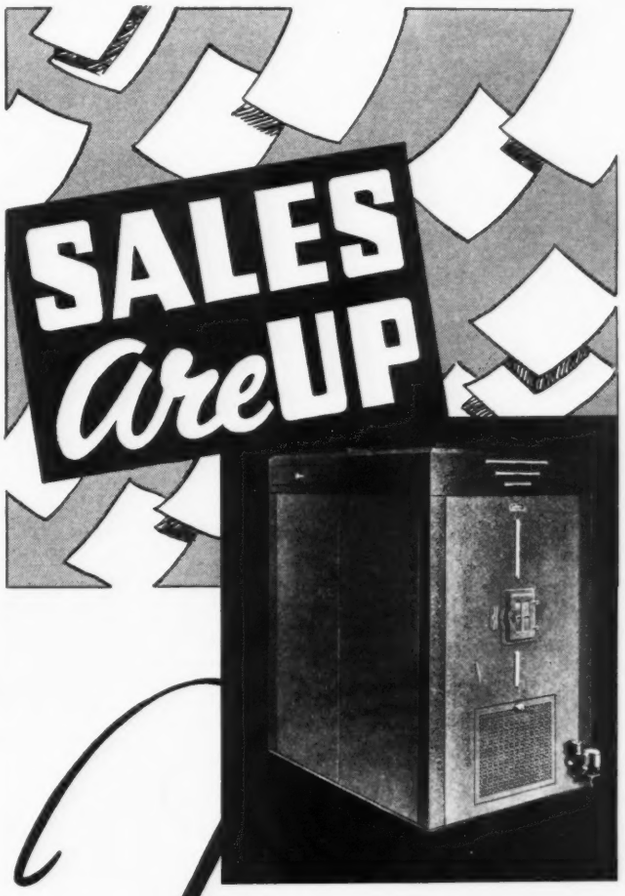

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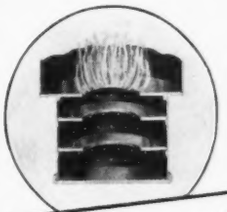

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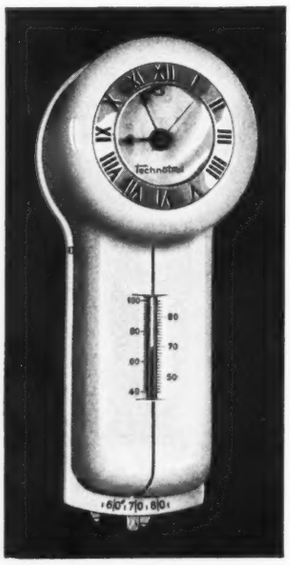
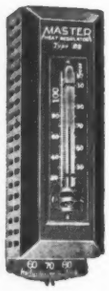


TYPE B-22



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to 141 gives 145½ degrees as our bonnet temperature. Then each register temperature is found by losing ¼ of a degree of temperature for each foot distant from the bonnet. Register 4, for example is 5 feet away or 1¼ degrees drop so 145½—1¼ equals 144 degrees, approx. Register 3 is 20 feet distant so 20/4 equals 5 degrees drop, so 145½—5 equals 140 degrees, approx.

Now in Items 35 and 36 we make use of this corrected register temperature. Using the actual register air temperature we will get at each register after deducting temperature drop, we correct the cfm for each register. By doing this if our register temperature is not 141 which we designed to, but 139 degrees due to temperature drop we must increase our cfm to put more air (at lower temperature) into the room.

So for each register we take the actual register air temperature shown in Item 34 and read our Factor Q from Fig. 1 and enter the corrected factor in Item 35. For instance the corrected register temperature for register 1 is 142 degrees. We find 142 degrees at the left of Fig. 1 and read across to the right till we hit the line, then drop down and find .0136. Register 2 is the same. Register 3 is 140 degrees—we read across from 140 degrees in Fig. 1, drop down and find .014. Register 4 is 144 degrees—we read across from 144 degrees in Fig. 1, drop down and find .0133. (Page —)

The remainder of Item 35 is filled in similarly.

Then in Item 36 we correct our cfm for each register. This is done by multiplying the Btu loss for each register shown in Item 31 by the register's factor in Item 35. For example the Btu loss of register 1 is 8,970 (Item 31). The factor in Item 36 is .0136. Then 8,970 times .0136 equals 121.99 or 122 cfm. Register 4 would be 9,990 Btu times .0133 equals 132.867 or 133 cfm. Register 8 would be 7,570 times .0142 equals 107.49 or 108 cfm. And so on until all cfm's are corrected.

Now we have our register temperature as it actually will be at each register and the corrected cfm to heat the room. Our next step is to find how large our branch pipe must be.

Before we can fill in Item 37 we must back track and once again consider this proposition of the frictional loss through ducts. Hundreds of thousands of words have been written about friction—still many do not appreciate the part friction plays. For a rough example imagine you are sprinkling your lawn. The city furnishes you a water pressure at your hydrant of, say, 50 pounds per square inch. If you attach a hose 50 feet long you will get a stream of water 35 feet long. But, if your hose is 100 feet long you will get a stream only 25 feet long. Friction reduces the flow of water.

So it is with your air supply system. The longer the pipe from bonnet to register *in equivalent length* the greater the resistance. And because some run shorter in actual length, but longer in equivalent length, may have the highest resistance we must here consult item 33 and see which run has the *longest equivalent length.*

And at this point we have to consider another problem. The bottle neck of any system is usually the stacks to the second floor. For lowest cost we want

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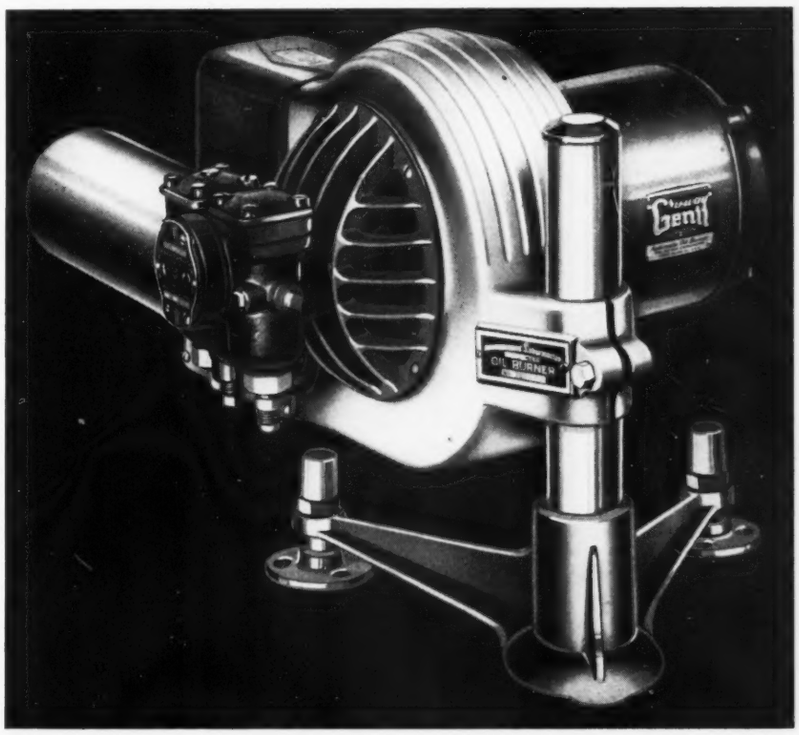

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to heat every room possible *with one stack* so we should look at item 36 and see which second floor room requires the most cfm. If possible, we want to heat the room with the greatest heat loss and greatest cfm with one stack and we want to keep the resistance as low as possible. We may find a room requiring more cfm through one stack than we can get at the resistance we have chosen. By designing to a higher resistance we may be able to heat this room with one stack.

Selecting Resistance

To consider these problems we consult Table 6. For instance in Table 6 we see that one 6.3-inch round pipe (12 by 3½-inch stack, table 7) will carry 80 cfm at .06 resistance but 95 cfm at .08 resistance.

The code says (article 6, item g)—

"Item (g) Selection of Design Friction Loss.

"The *total* resistance to flow of air through ducts is due to two types of losses—friction losses and dynamic losses. This is equivalent to the friction losses in all straight runs, plus the dynamic losses in all elbows and turns expressed in terms of friction losses in equivalent length of straight duct.

"The *commonly accepted friction chart* is shown in Fig. 3. In the use of this chart a fair recommendation would be to design the average systems, where the capacities of the trunk having the longest equivalent run requires as much as 1600 cfm, on a resistance of .06 inch; from 1600 to 2400 cfm on .08; from 2400 to 3600 cfm. on .10; and from 3600 to 5500 cfm. on .12 inch of water per 100 feet of equivalent length.

"Where limitations of pipe size of any stack prevent the use of the above recommendations, the design static pressure may be arrived at in the following manner:

"By observation select the run having the greatest resistance and find its total *equivalent length*. To determine this resistance, from Fig. 3, find the resistance in inches of water per 100 feet necessary to handle the required cfm. through this duct of available size. Multiply this resistance per 100 feet by the total equivalent length and divided by 100. The result is the design static pressure of this run, as well as the design static pressure of the entire system provided it is within practical limits."

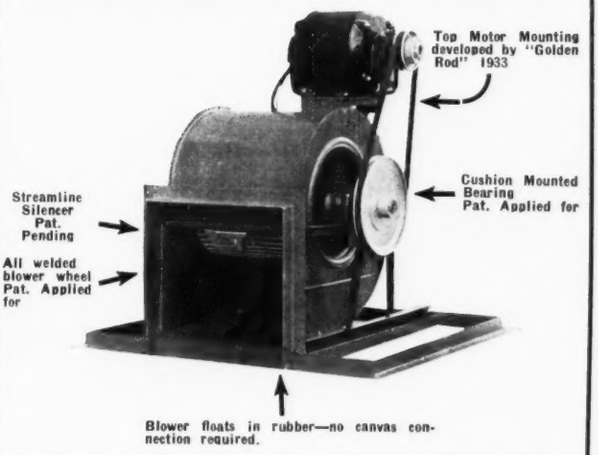
In our problem we look across item 36 and find that bedroom number 3 requires 107 cfm. We refer to Table 6 and decide that we would like to design the system to .06 resistance in accordance with the code for total cfm's under 1600 and find that 110 cfm at .06 requires a round pipe of 7.0 inches. Then referring to Table 7 we find that a 7.0-inch round pipe calls for a wall stack 10 by 4½, 11 by 4, 13 by 3½, 16 by 3.

We know that this pipe size will be reduced when we correct for equivalent lengths so we decide that our system can be designed at .06 resistance and still use one stack to the bedroom.

We are now ready to consider item 37. We turn to Table 6 and in the column for .06 resistance we pick out the closest cfm requirements for each room. For the kitchen the cfm in item 36 is 122 and the round pipe size for 125 cfm is 7.4 inches. One half the living room is 85 cfm and the round pipe size 6.4 inches. Bedroom number 1 is 67 cfm and the round pipe size 5.9 inches. And so on across item 37.

Now we must correct these sizes for the unequal equivalent lengths of each run so that a long run will

GOLDEN ROD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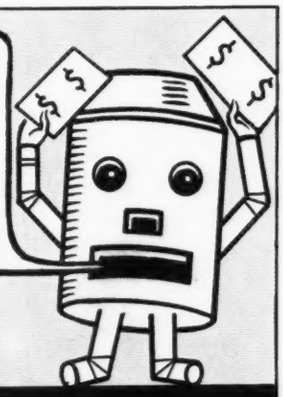

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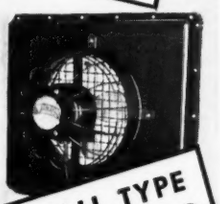

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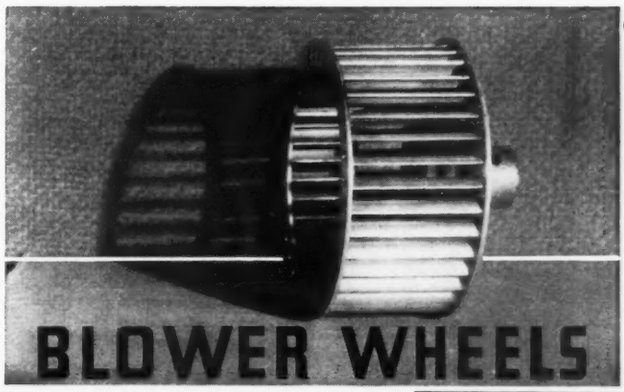

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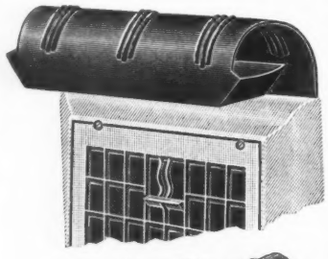

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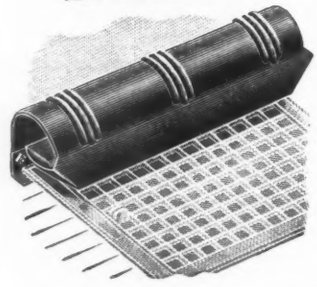

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deliver its correct quota of air without throwing dampers. The code says (Items h and i)—

"For individual round pipes refer to Table 6 for diameter required to handle cfm. at design static. Correct for pressure differences due to unequal equivalent lengths by multiplying diameter of pipe by the correction factor corresponding to the total equivalent length from bonnet to register, as shown in table 9."

Item 38 is filled to show the correction factor used for the various lengths. For instance, the kitchen equivalent length from item 33 is 37 feet. In Table number 9 we find 40 feet to be the closest length and the correction factor is .835. We therefore multiply 7.4 inches from item 37 by .835 and get 6.179 or 6.2 inches. This is our corrected round pipe size and we enter the size under the kitchen column in item 39. Bedroom 3, which worried us because of stacks, shows an equivalent length of 63 feet (item 33) and an uncorrected round pipe size of 7.0 (item 37). In Table 9 we find the factor for 63 feet is .93 so we multiply 7.0 by .93 and get 6.51 or 6.5 inch round pipe.

Before we go any farther we look at Table 7 and find 6.5 inch round pipe will require a 10 by 4, 12 by 3½, 14 by 3, 15 by 3 stack. We must keep our stack not over 3½ inches deep so we select a 12 by 3½ stack. We know that our "doubtful room" can be heated with one riser and at .06 inches of resistance. We therefore proceed to fill in item 38 and show our results in item 39.

For item 40 we turn to Table number 7 and fill in all riser sizes where there will be a stack.

In item 41 the code says that registers in the baseboard or just above should use a face velocity of approximately 300 fpm. Our registers are in the baseboard except the recreation room which is above the breathing line. For registers above the breathing line the code suggests 500 fpm. In item 41 we fill in 300 fpm for all registers except the recreation room which uses 500 fpm.

For item 42 we take the catalog of our register manufacturer and for 300 fpm and the sizes of stacks shown in item 40 we select the register size.

In the next article we will take up the return air system and design of the basement ducts.

◆

Air Conditioning on Wisconsin Farms

(*Continued from page 72*)

culation it is hoped that tests may be run to determine optimum housing requirements for farrowing and pig growth.

Research Needed. These examples of the air conditioning of farm structures other than houses are all practical applications of a new science to agricultural engineering problems. Some day we will balance b.t.u. cost, insulation cost, market fluctuations and temperature as well as humidity effect on production to determine the most economical relationships for these factors.

Insulation factors and costs are a matter of record while b.t.u. costs may be easily calculated. Market trends are now being scientifically forecast. Research must still determine optimum conditions for the production of milk and eggs, for the growing of pigs, lambs and chicks, and for the storage of perishable fruits and vegetables.

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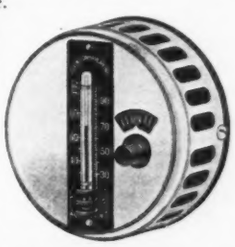

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Oil Furnaces in Research Residence

(Continued from page 56)

per hour to 240,000 Btu per hour, or a difference of 120,000 Btu per hour, was accompanied by an increase in capacity of from 87,500 Btu per hour to 155,500 Btu per hour, or a difference of 68,000 Btu per hour.

In any given furnace installation, in which a constant value of CO_2 was being maintained, an increase in the amount of heat release in the furnace resulted in higher temperatures of the flue gas and hence in larger flue gas losses per pound of fuel. This condition is reflected in the efficiency curves of Fig. 7, from which

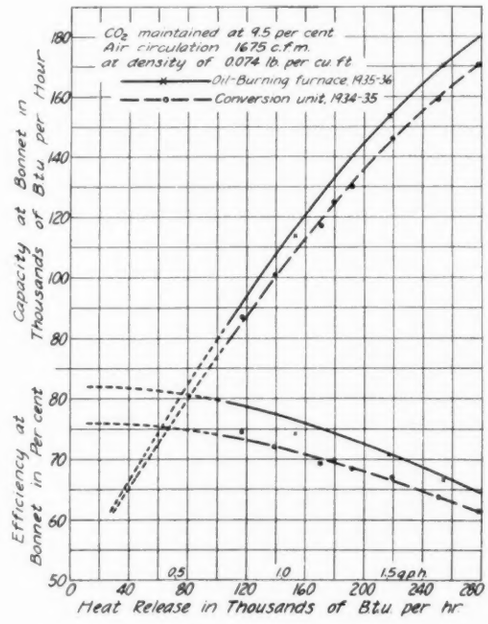

Fig. 7—Performance curves of oil furnaces in Research Residence

it may be observed that the furnace efficiency decreased as the rate of heat release was increased. The tests made under actual service conditions, which are discussed in a later section, also tended to confirm the conclusion that the most economical utilization of fuel in a given installation would be obtained with small rates of heat release in the furnace.

A comparison of the results from the conversion unit and oil-burning furnace, as shown in Fig. 7, indicated that, for a given rate of heat release in the furnace, the greater amount of heating surface of the oil-burning unit resulted in a greater amount of heat being transmitted from the furnace gases and absorbed by the air circulated. This conclusion was also confirmed by the tests made under actual service conditions.

The efficiency curves in Fig. 7 also show that for a furnace having a given amount of heating surface the best rate of oil input as defined by the heat release occurs at a value too low to be used as a practical basis for the design of oil-burning furnaces.

Variation in CO_2 in Flue Gas

The performance curves in Fig. 8 indicate that for a constant quantity of air circulated and a fixed rate of

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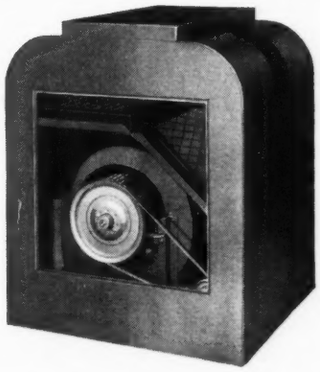

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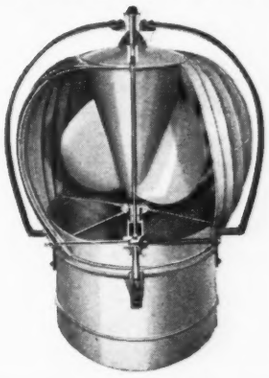

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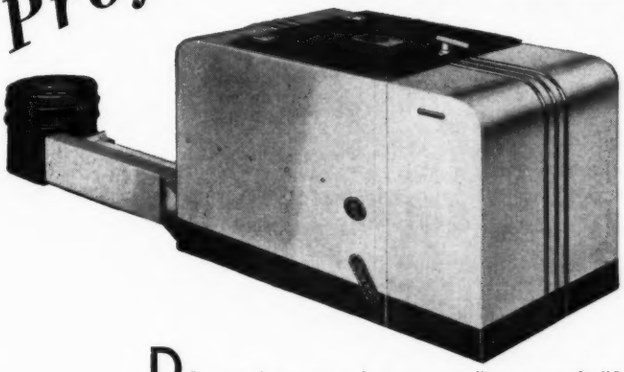

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Dept. 1011 609 W. Lake St., Chicago, Ill.

oil input to the furnace, the capacity and efficiency of the heating unit were also affected by the combustion characteristics, as indicated by the percentage of CO_2 in the flue gas. Adjustments in the fuel-air ratio were made by means of the adjustable opening in the air-inlet to the burner, and variations in the CO_2 content in the flue gas from 5½ per cent to 11½ per cent could be obtained. In no case was there any indication of incomplete combustion of the fuel.

The increase in capacity and efficiency brought about by an increase in the CO_2 content in the flue gas was not marked. For example, the efficiency curves for the 12.84-lb oil input rate indicate that the efficiency was increased from 61 per cent to 67.5 per cent when the percentage of CO_2 in the flue gas was changed from 6 per cent to 12 per cent. In other words, for each increase in the CO_2 content of one per cent, there was obtained an increase in bonnet efficiency of approximately one per cent.

However, it should be recognized that these results were obtained with a furnace in which the temperature of the flue gas at the outlet of the radiator was quite low and did not exceed approximately 500 F. In the case of furnaces which are not provided with sufficient effective heating surface, and which are fired at such a high rate of oil input that the temperature of the flue gas at the outlet exceeds approximately 500 F, any increase in the CO_2 content of the flue gas will be accompanied by much larger increases in furnace efficiency.

The stack-loss curves shown in Fig. 9[5], serve to ex-

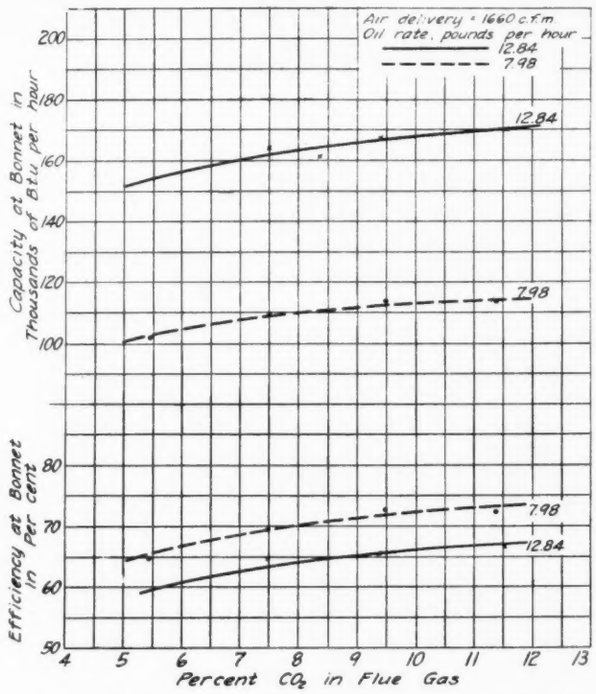

Fig. 8—Performance of an oil-burning furnace with various percentages of CO_2 in the flue gas

Research Residence installation 16, forced-air system. Furnace designed for oil combustion using gun burner. Tests conducted with continuous operation of burner and fan. Season 1935-36.

[5]Curve reproduced from U. S. Dept. of Agriculture Technical Bulletin No 109 entitled, A Study of the Oil Burner as Applied to Domestic Heating, by Arthur H. Senner, July, 1929.

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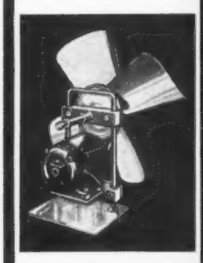

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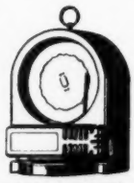

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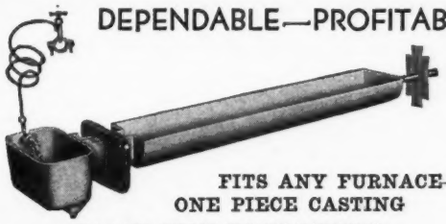

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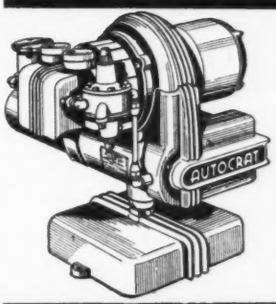

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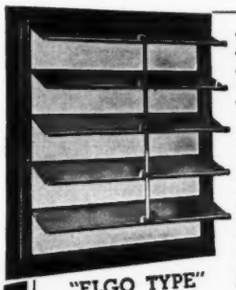

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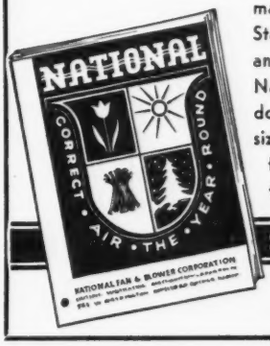

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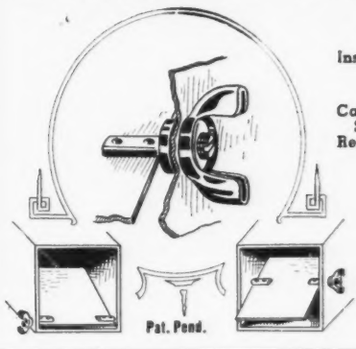

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plain these conditions. For instance, for low values of the flue gas temperature, the relative change in the stack loss will be small even for fairly large changes in the CO_2 content of the flue gas. In other words, if oil-burning furnaces are provided with sufficient effective heating surface for a given rate of oil input, so that the leaving flue gas temperature will be low, then the unit may be expected to perform satisfactorily under diverse conditions of installation in the field, even with fairly wide deviations in the adjustment of the fuel-aid ratio of the oil burner.

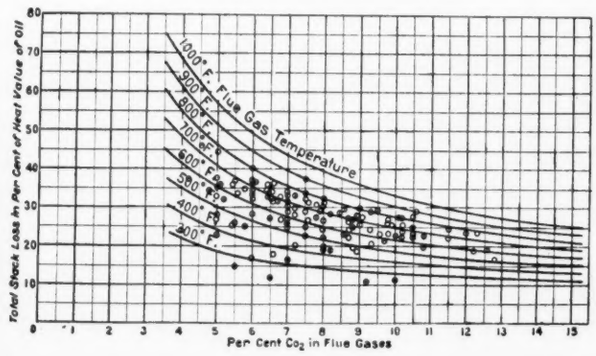

Fig. 9—Stack-loss curves for combustion of domestic oil-burner distillates

These tests which were made under conditions of continuous operation have indicated that considerable differences in the capacity of oil-burning furnaces may be expected with variations in operating conditions. However, since capacity alone is not an index of performance under intermittent service, and since the tests were based on the maintenance of equilibrium conditions, which are seldom met with in actual service conditions these tests were supplemented with tests made under conditions of actual service.

(To be continued)

◆

Konzo Chimneys

(*Continued from page* 78)

in. in diameter. These specifications are those stated in the "A.S.H.V.E. Code of Minimum Requirements for the Heating and Ventilation of Buildings (Edition of 1929)".

The Code makes no specific recommendation for furnaces of larger capacity. However, the values given in the Code show the relationship between the minimum chimney sizes for heating boilers and the steam boiler capacity in terms of sq. ft. of steam radiation. If the latter values are converted over to terms of equivalent B.t.u. output at the boiler, then the relationships between chimney size and B.t.u output of the combustion source can be obtained, which may be applied fairly well to warm air furnaces. In this case each sq. ft. of steam radiation was assumed as being equal to 240 B.t.u. per hour output. These relationships are shown plotted in Fig. 5. It may be observed, for example, that a warm air furnace having a bannet capacity of 400,000 B.t.u. per hour requires a chimney not less than 183 sq. in. in inside area.

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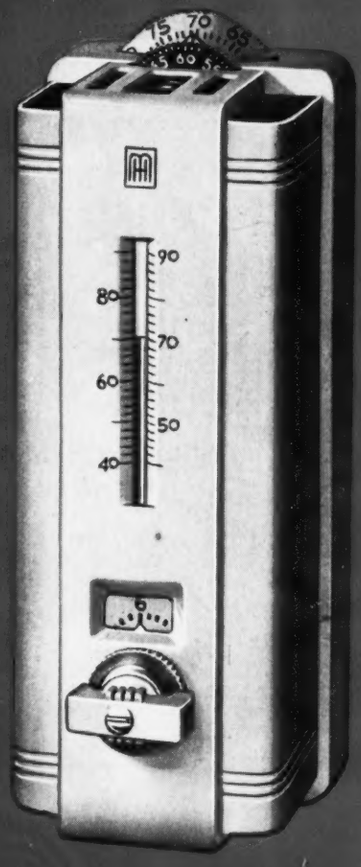

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A Wide Open Letter to the Air Conditioning, Heating, and Refrigeration Industries!

from the Refrigeration & Air Conditioning Institute of Chicago

Number 1.

Subject: BUILDING TO SERVE YOU BETTER

This is the first of a series of informal messages addressed to manufacturers, contractors, dealers and distributors, in the fields of air conditioning, heating, ventilating and refrigeration. The purpose of the messages is to acquaint the employers in these fields with the work of the Refrigeration and Air Conditioning Institute, and to report regularly on the progress the Institute is making in furnishing competent and thoroughly trained men to meet these industries' needs.

A recent survey shows that in air conditioning alone, from five to seven thousand additional trained men will be needed every year for the next ten years. Ordinarily, this condition might prove a serious handicap to an industry advancing with such rapid strides as is air conditioning. But fortunately, this institution working in close cooperation with more than seventy manufacturers, will supply the men the industry needs . . . **trained exactly as the industry wants them trained.**

Considering the vast importance of its work, and the great benefits employers will derive from its operation (without cost to them), the Institute believes that every employer in the fields of air conditioning, heating, ventilation and refrigeration should read its messages regularly.

* * *

To meet the increasing demand for RACI Trained men, and to double the time now being allotted for final training in its laboratory and shops, the Institute is now preparing to spend a quarter million dollars for new buildings and new equipment. Two of the three buildings now used in its work will be torn down completely and the new laboratory and shops building shown below, adjoining the present administration building on the right, will be ready for student training early in 1938. This building will be of glass block construction, windowless and completely air conditioned. It will contain two floors, each 65 x 205 feet, on which will be installed every type of air conditioning, heating, ventilating, and refrigeration equipment for exclusive student operation and study, under a group of competent engineers and instructors (one to each ten students). Students will spend approximately 200 hours working on this equipment, but only after having put in more than 1,000 hours in preparatory study in their own homes.

* * *

The Refrigeration and Air Conditioning Institute has been "officially" endorsed by more than seventy of the leading manufacturers in the field, and its policies and the conduct of the Institute is supervised by a Board of Governors made up of engineers and executives appointed by some of these manufacturers. The members of this Board come from their plants to Chicago for regular conferences and inspections of the Institute's work. We believe this to be the only Institution of its kind to be officially endorsed by a large group of outstanding manufacturers and its training program actually supervised by outside engineers and executives.

* * *

We invite you to visit the Institute and inspect its facilities and methods the next time you are in Chicago.

Ray A. Smith

PRESIDENT

P. S. If you do not have a copy of the Institute's "Report to the Industry" . . . a 200 page, cloth bound book with 15 original photographs. . . . Please ask for it on your letterhead, giving name and title of executive to whom it should be directed. No obligation.

REFRIGERATION and AIR CONDITIONING INSTITUTE · 2130-2158 Lawrence Ave., CHICAGO

ASSOCIATION ACTIVITIES

NWAH&ACA Annual

The National Warm Air Heating and Air Conditioning Association is preparing for its Winter Convention on January 25 and 26 at the Roosevelt Hotel, New York City. This is the same week as the Biennial Exhibition of Air Conditioning Apparatus in the Grand Central Palace, New York City. The American Society of Heating and Ventilating Engineers is to meet at the same time in the Biltmore Hotel.

Formal announcement and program is promised well in advance. An invitation is extended to manufacturers, heating contractors, engineers and the entire industry.

During the winter meeting, the association is planning to celebrate the 20th anniversary of its Research Work carried on in cooperation with the University of Illinois during the past two decades.

The entertainment committee promises something very much out of the ordinary.

Allen W. Williams, Managing Director.

◆

Akron

At a recent open meeting of all licensed furnace dealers in Akron held under the auspices of the Warm Air Heating, Sheet Metal and Roofing Association, a committee was appointed to rewrite the Mechanical Heating Ordinance in order that hereafter the installation of air conditioning jobs will be covered under the local heating code. The present code was written several years ago prior to the advent of air conditioning and it has not been revised since it was adopted by the Akron City Council.

Through the efforts of the Akron association a full time heating inspector was recently appointed to enforce the ordinance. Since the inspector assumed his position nearly fifty licenses have been issued by the local building department.

Another open meeting will be held in the near future to which will be invited all licensed dealers for the purpose of discussing the advisability of a cooperative local newspaper advertising campaign designed to sell the public on the idea of having warm air heating work done by licensed contractors.

The Association is also cooperating with the Builders Exchange of Akron and Vicinity in a display in a downtown store window during Fire Prevention Week. The display will consist of a warm air furnace having a smoke pipe full of holes, surrounded by a pile of inflammable material as contrasted with a modern installation with everything in good condition. This display will be featured by both local newspapers and should emphasize the fire hazard in a home where the heating plant is neglected and where trash is allowed to accumulate near the furnace.

A. W. Dickson, Executive Secretary.

◆

Pennsylvania

The Sheet Metal Contractors' Association of Pennsylvania has been inactive for some years but secretary M. F. Liebermann reports that recently several requests have reached his office to revive the old association.

Toledo

The Toledo Sheet Metal & Roofing Contractors Association, Inc. has every reason to be satisfied with results obtained during the past year. They inaugurated the Toledo Plan for Sheet Metal Working Apprenticeship. This plan in cooperation with the Toledo Board of Education and the Ohio State Board for Vocational Education, is now entering upon its second year of training for sheet metal apprentices. Last year's results were very gratifying and satisfactory, and judging from the interest manifested during the organization of a class for the ensuing term they are looking forward to another successful year for this school.

The association is also the proponent of a gravity warm air heating ordinance adopted by the Toledo City Council on May 10th of this year, becoming effective on June 10th, and having been in full operation with a full time competent inspector since August first. The Warm Air Heating Committee is now at work on an amendment to the gravity ordinance covering forced air and stoker installations. It has required no small amount of energy to draft an ordinance, and to convince all the tribunals in City Hall of its merit and necessity.

The fact that interest in the Association is growing is manifested by the number of applications for membership received during the past several months.

Henry C. Bitter, Secretary.

◆

Evansville

The Heating and Air Conditioning Conference held in the Continental Room of the Vendome Hotel, Evansville, Indiana, on August 27, was welcomed by A. J. Becker, Secretary-treasurer of the Ohio Valley Hardware & Roofing Co., Evansville.

The program included:

"Forced Air and Gravity Heating" by L. R. Taylor, vice president, International Heater Co., Utica, N. Y.

"Characteristics and Performance of Blowers" by E. B. Lau, president, Lau Blower Company, Dayton, Ohio

"Experience with Various Duct Systems" and "Estimating Costs" by H. F. Randolph, International Heater Co., Utica, N. Y.

"Automatic Control on Air Conditioning Systems" by C. M. Buck, Engineer, Minneapolis-Honeywell Regulator Co., Minneapolis

"Research Work and Its Practical Application" by S. Konzo, Special Research Associate, University of Illinois.

"Registers and Grilles" by Ralph W. Blanchard, President, Hart & Cooley Manufacturing Co., Chicago

"Summer Cooling" by C. L. Olin, Servel, Inc., Evansville

◆

Chicago

The Chicago Warm Air Heating Golf Association held the last meet of the season at Olympia Fields on Thursday, September 16.

Harvey Hiller of Laclede Christy Corporation was host. Prizes were awarded and officers for the coming year re-elected.

Blind Bogie Prize winners for the day were:

	Gross	Handicap	Net
P. M. Barth	88	12	76
G. B. Wilson	117	42	75
R. P. Wettstein	109	25	84
C. E. Anderson	107	27	80
J. P. Kraft	120	35	85
H. R. Hiller	99	18	81
D. C. Ellison	102	18	84

Paul M. Barth won the Association cup with an 88-10 handicap and a net 78.

Association Activities . .

Wisconsin

The Master Sheet Metal, Heating, Ventilating and Air Conditioning Contractors Association, Incorporated, of Wisconsin, is now planning a state convention at the Republican Hotel in Milwaukee for February 7, 8 and 9, 1938.

One day will be devoted to air conditioning and heating, for members only, presided over by some practical and theoretical engineer—ala school.

President R. H. Gehrke of Shawano has been doing some splendid missionary work. Quite a few members have been added to the roster through his efforts.

Paul L. Biersach, Secretary.

◆

Philadelphia

The first fall meeting of the Association of Roofing: Metal & Heating Engineers of Philadelphia was well attended. "Roofing and Weatherproofing at Boulder Dam" in moving and talking pictures was presented.

The officers and board of directors meet once or twice a month prior to and arrange a program for each meeting.

The heating discussion meetings, which were held twice a month from April, 1936, to April, 1937, were resumed on September 20. The Furblo Institute lessons and the new Technical Code were selected as a basis of the discussions, accompanied by white sheet plans and figuring sheets as shown in the American Artisan for each one present. The repeat attendance and additions denoted the interest. Reports also indicate that these discussions have been of practical help.

The board and committees have formed a progressive program for activities during the balance of 1937 and in 1938, starting with the distribution of 10,000 blotters which the metal jobbers have consented to enclose in their mail to the trade, accompanied by a postpaid reply card. The blotter reads "The future business of ALL shops would be greatly improved by:

Licensing ordinances
Installation codes for roofing, heating and sheet metal
Bookkeeping, tax information and service
Apprenticeship training
Collection Bureau and references
Roofing discussions by experts
Heat engineering class experts

In co-operation with the Board of Education, who have erected two very large schools and allocated one entire floor in each to vocational education, arrangements will be made for apprentice and mechanic classes of instruction and shop practice.

Upon request, the association will again issue a monthly pamphlet to the entire trade, to be called "Trade Association News," The first issue will be mailed in October.

Various city ordinances have been suggested and several have been issued by the Fire Marshall. These will be examined and an attempt made to help in their enforcement.

The Board of Directors includes:

Weston Clarke
Charles F. Geissler
William Frech
John Frick
John Naegele, Jr.
Richard Guenther
George Obenholtzer

Charles Salinger is president; Walter M. Kulzer, vice-president; and Oliver Bartholomew, treasurer.

Fred U. Ritter, Secretary.

◆

Milwaukee

The Master Sheet Metal, Heating, Ventilating, and Air Conditioning Contractors Association of Milwaukee, reports splendid meetings all year. To get better acquainted at each meeting, the members are asked to rise and introduce the member sitting to his right. They have a display board with the names of all members, active and associate, and recording those who have paid their dues.

The Committee on codes and licensing is active and prominent engineers in the industry are co-operating. After they complete and have established a satisfactory code and license law on the statute books of the municipality, they aim to do the same thing for the State.

Another committee on legitimate shops works with the distributors for their own and the association benefit.

There are over sixty members in the local. Open meetings are held four times a year, at which non-members belonging to the industry are invited, also jobbers and distributors to discuss matters of mutual benefit.

Paul L. Biersach, Secretary.

◆

Salt Lake City

The Sheet Metal & Warm Air Heating Contractors Association of Salt Lake City held their first fall meeting on September 27 and members were enthusiastic over the outlook of the wonderful future business in Salt Lake City.

There is a training school for apprentices at the West High School, meeting two nights a week, and attendance is compulsory.

The union scale of wages since October 1 in Salt Lake is $1.10 per hour for journeymen.

Ray Pons is president and John Sieverts is vice-president.

M. L. Groo, Secretary.

◆

Wausau

The Wausau Sheet Metal Contractors were hosts to the Board and Directors and members of the Master Sheet Metal, Heating, Ventilating and Air Conditioning Contractors Association, Inc., of Wisconsin, on September 10.

An open meeting was held on October 4 at Guild Hall, Republican Hotel, Milwaukee for the purpose of discussing the problems confronting the industry, particularly betwixt the manufacturers and distributors on one side and the sheet metal contractors on the other.

Sheet Copper Handbooks, Shop Rules for Employees (wall cards) and University of Illinois Bulletin 266 were distributed to those members entitled to them.

Paul L. Biersach, Secretary.

◆

Chicago

The regular meeting of the Furnace and Sheet Metal Institute was held on September 17. President Louis Drehoble opened the meeting to an unusually large attendance with an announcement that a course in sheet metal working was being given at the Carl Schurz High School on Tuesday and Thursday evenings. Mr. Drehoble urged all who were interested to register at once, as the course was very popular last semester and consequently very crowded.

Ralph W. Poe gave an interesting demonstration of simplified sheet metal pattern cutting and later donated three of his Ralpo cutting tools as door prizes.

Speakers of the evening included Joe Walters, D. C. Ellison, John Spitzer, I. W. Rowell, Art Meiche and Mike Reif.

◆

Fan Manufacturers

The National Association of Fan Manufacturers held their Summer Meeting at the Equinox House, Manchester, Vermont, on September 23, 24, 25, 1937. Consideration was given to the report of the Engineering Committee covering certain refinements and additions to the "Standard Test Code for Disc and Propeller Fans, Centrifugal Fans and Blowers."

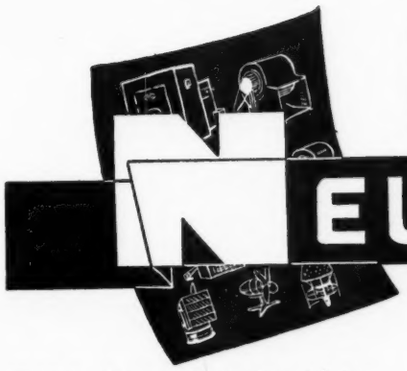
As in the past, the Committee has cooperated on this project with similar groups from the American Society of Heating and Ventilating Engineers and the American Society of Mechanical Engineers in order that respective codes would coincide.

L. O. Monroe, Secy.-Treas.

◆

Sales and Collections

Value of wholesale trade increased in July, 1937, from July, 1936, and collections on accounts receivable were made at about the same rate over this period, according to reports of wholesalers in the monthly joint study of the National Association of Credit Men and the Bureau of Foreign and Domestic Commerce, Department of Commerce.



For your convenience a number has been assigned each item. Check the items in which you are interested on the coupon on page 114 and mail to us. Complete information will be forwarded.

● Indicates product not listed in 1937 Directory.

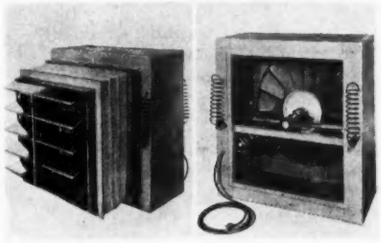
△ Indicates product and manufacturer not listed in 1937 Directory

NEW PRODUCTS

●150—New Home Ventilator

Gar Wood Industries, Inc., Air Conditioning Division, Detroit, announces a new Gar Wood ventilator which removes hot, stagnant air from bedrooms and the attic and draws in fresh, cool, night air into the home.

The ventilator is controlled by a conveniently located switch. The shut-



ter which comes as a part of the ventilator, automatically opens and closes with the turning off and on of the fan and eliminates opening and closing the windows by hand.

The new Gar Wood ventilator is suitable for home ventilation and cooling, or wherever air is stagnant.

The Gar Wood ventilator consists of a fan and motor enclosed in a metal case, suspended on coil springs from the ceiling or rafters. A vibration deadening canvas boot connects the fan housing proper with a wooden frame which is installed in a window casing or other opening for the discharge of hot air. The frame is equipped with an insect screen and an automatic outlet shutter which opens when the fan begins to operate and closes when it stops, for protection against rain, dust and insects. The shutter is made of aluminum and will not corrode or stick.

◆

151—Spray Humidifier

Rega Manufacturing Company, 79 Mount Hope Avenue, Rochester, New York, is introducing a new Rega spray humidifier for steam, vapor, hot water or warm air heated buildings—apartments, factories, offices, houses, stores, etc. In the bottom of the deep bowl on a 48 in. standard there is placed a Rega self-cleaning spray nozzle, connected by a tubing to the city water line. Water pressure of 25 pounds or more forces a fine fog spray from the nozzle up through the bowl into the air in the room. Spray rising above the bowl is said to be absorbed by the air and that which condenses on the inside of the bowl is carried away by another tubing to the drain.

The Humidifier can be used with or without humidity controls.

◆

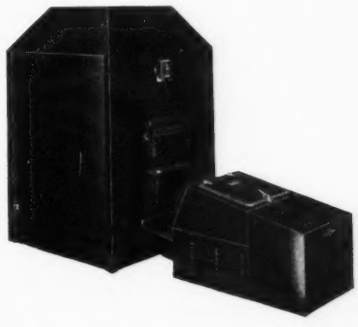
152—A-C Welding Electrodes

Westinghouse, East Pittsburgh, Pennsylvania, announces new coated electrodes especially adapted for alternating current welding. These Crucible-Weld electrodes, available in sizes from 3/32 to 5/32 inches in diameter, are popularly priced and are made in two grades of black and brown. In addition a special 1/16 inch electrode is available for very low current values.

◆

153—Kolstoker Heating System

The Anchor Stove & Range Company, New Albany, Indiana, announces its new Anchor Kolstoker Heating System, a complete warm air unit with automatic Kolstoker feed, with both furnace and stoker designed by their own engineers to function together



with maximum efficiency, and the Anchor guarantee of satisfaction covers the whole unit.

The stoker offers the patented Anchor, safe, sound-proof cabinet; the Anchor sectional burner head, underfeed principle; and complete automatic control of coal feed and temperature.

The Anchor Kolstoker Heating System is in black and red. It is furnished in sizes and prices to meet the demands of both small and large homes.

154—Corner Cutting Tool

Ralph W. Poe, Canton, Illinois, announces the Ralpo Cor-Cut, a corner

cutting tool. This tool is designed for cutting in corners and hard-to-get-at places where the Ralpo auto body cutter will not reach.

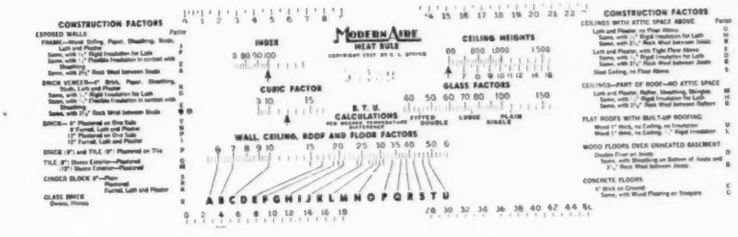
◆

△155—ModernAire Heat Rule

ModernAire Engineering Company, 107 S. W. Second St., Des Moines, Iowa, is offering the ModernAire heat rule, designed for simplifying the engineering of forced air and gravity heating installations. The rule is accompanied by a four-page instruction sheet and special engineering data sheets for use with the rule.

It was designed fundamentally to eliminate as far as possible the necessary mathematical calculations used in figuring heat losses and their results in pipe sizes.

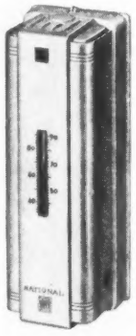
Areas of exposed surfaces are set down on the special data sheet and the multiplication for heat loss made on the rule. At the same time cfm, pipe size and velocity automatically set themselves on the rule. The idea was to supply the dealer just as much information as he might need on the job, in compact form, without carrying a bulky set of tables or various information. The heat loss factors shown on the rule are in accordance with those issued in the new 1937 Technical code for mechanical and forced-air heating by the National Warm Air Heating and Air Conditioning Association. On the back of the rule there is a round pipe conversion table for areas to diameters and one from diameters to square duct sizes. On the sliding member of the rule there is an 1/8-in. scale and a 1/4-in. scale for measuring scales planned.


CONSTRUCTION FACTORS
MODERN AIRE
HEAT RULE
INDEX
CUBIC FACTOR
CEILING HEIGHTS
GLASS FACTORS
B. T. U. CALCULATIONS
WALL, CEILING, ROOF AND FLOOR FACTORS
A B C D E F G H I J K L M N O P Q R S T U
CONSTRUCTION FACTORS

New Products . . . . . .

156—Pneumatic Thermostat

National Division of the Minneapolis-Honeywell Regulator Company, Minneapolis, Minn., introduces its "Helmet Sealed" thermostat in a new, modern case designed along the lines



of other Minneapolis-Honeywell thermostats. This also affects the National line of room type humidity controllers. The overall size has been greatly reduced, and the simplified adjustment features of the previous model have been retained. The thermometer has been recessed for protection. The temperature range of the new thermostat has been changed from 35-82 deg. F. to 46-90 deg. F.

◆

△157—Contour Sawing

Continental Machine Specialties, Inc., of Minneapolis, announces as a new machine tool, the Metalmaster. According to the manufacturer, machining operations that are usually carried out by shaping, milling, lathe

work or torch cutting are accomplished on the Metalmaster at an appreciable time saving.

An outstanding feature of the Doall Metalmaster models is the quicker saw blade joining made possible through an entirely new butt welder.

For speed control a Job Selector Dial provides exact data on saw speeds and saw specifications for 48 materials and a tachometer with speedometer type dial indicates to the operator at eye level the exact speed at which the machine is operating.

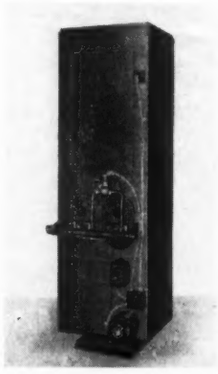
Four way table tilt—45 deg. forward, 10 deg. back and 10 deg. laterally is provided as well as a new type of controlled power work feed.

The Metalmaster models are built in two sizes, found to be of ideal capacity for Contour Sawing.

◆

158—BC Janitrol Conditioner

Surface Combustion Corporation, Toledo, Ohio, announces a new Janitrol gas-fired winter air conditioner especially adapted for low cost housing projects, individual apartment installations, etc. The new "BC," conditioner, is made in two capacities—45,000 and 90,000 Btu. input.



The design of the BC unit incorporates a squirrel cage type of blower.

The manufacturers offer various combinations of controls, humidifying equipment and filters with the new unit, permitting the owner of the small or inexpensive home to have true winter air conditioning at a comparatively small outlay.

◆

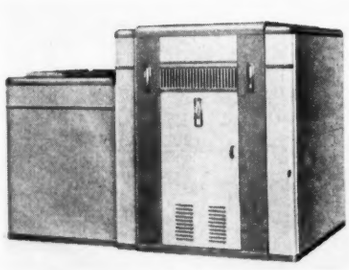
●159—Arco Cooling Attachment

American Radiator & Standard Sanitary Corporation, 40 West 40th Street, New York, N. Y., announces a new cooling attachment for the Arco air conditioner 101-B and 201-B for use in connection with cold water cooling. The new unit is designed to be installed on the discharge side of the conditioner and is made in two sizes for the small and average-size house.

Tentative data indicates a water rate on the smaller unit of from 3 to 6 gallons per minute and on the larger unit of from 6 to 12 gallons per minute, producing 1.6 to 2.1 tons of cooling with the first unit and 3.1 to 4 tons of cooling with the second.

The performance data is based on the use of 75 per cent recirculated air at 80 deg. F. dry bulb and 67 deg. F. wet bulb temperature and 25 per cent outside air at 95 deg. F. dry bulb and 75 deg. F. wet bulb temperature.

The jacket, finished in green enamel with dark green ends, matches the color of the Arco conditioner.



160—Oil Burning A.C. Unit

The Fox Furnace Company of Elyria, Ohio, has recently announced a new oil burning air conditioner with capacity at register ranging from 187,000 to 331,000 Btu. per hour. This new product will have ample capacity for the largest residences.

This new Sunbeam unit is furnished with or without integral, coordinated gun-type oil burner.

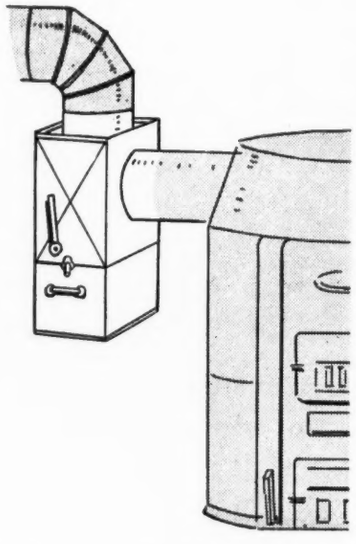
Cabinets are constructed of 20-gauge cold rolled furniture stock—rounded corners, pleasing proportions and two-tone glossy green enamel finish.

According to C. A. Olsen, president of The Fox Furnace Company, this large capacity unit completes the line of Sunbeam Oil Burning Air Conditioners ranging from 50,000 to 331,000 Btu. capacity at register per hour.

◆

△161—Smokleaner

Smith-Crane Co., 626 Broadway, Cincinnati, Ohio, announces the Smokleaner, a new domestic heating plant accessory for which patent application has been made. It is a galvanized metal box-like apparatus to be installed in the smoke-pipe leading from



the furnace to the flue and serves the purpose of trapping and holding the soot or fly-ash which is drawn out of the fire-chamber. It is said to be very effective in preventing the unburned solids from reaching the atmosphere, to be deposited later as a film of grit and grime. A drawer in the bottom of the box can be taken out and the trapped dirt removed.

New Products . . . . . .

●162—Pressure Burner Pump Unit

The Teesdale Manufacturing Company of Grand Rapids, Michigan, announces the addition to their line of oil burner specialties, of an improved pump unit known as the Type "N."

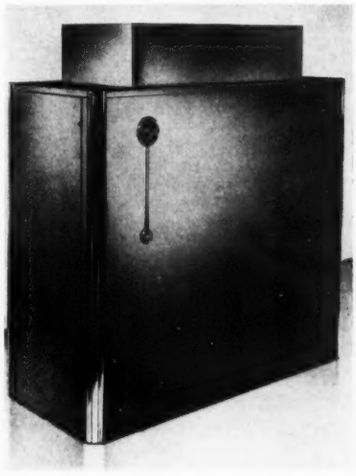
In the one unit are combined motor,

pump, valves, strainer and motor pump coupling, so arranged that it can be serviced without breaking the oil line. It is available for any kind of mounting, either with flanged end, foot mounting or as shown. Oil pump and other working parts are permanently submerged in oil.

●163—Gas Burning Furnace

The Herman Nelson Corporation, Moline, Illinois, announces a new series of gas-burning air conditioning furnaces in three sizes—N-500, N-1000 and N-2000 with 100,000, 125,000 and 150,000 Btu. output at the register. Induced draft fans provide a positive discharge of spent flue gases.

A logarithmic spacing of heat-



catching fins both inside and outside the flue passages assures uniform temperatures over the entire bonnet area.

This series is equipped with quiet, smooth operating air circulating fans and Dustop, glass wool filters. Kant Klog spray type humidifier operates only when the furnace is on and air is being circulated through the registers.

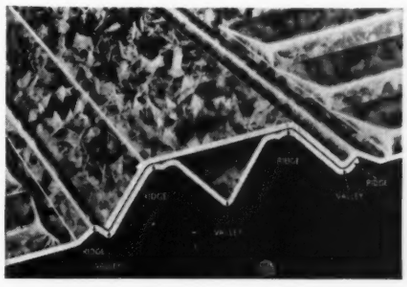
Summer cooling and dehumidification may be included by the addition of the Herman Nelson cooling coil and condensing unit.

This furnace is compactly designed and is finished in gray opalescent baked enamel with stainless steel trim.

164—Triple Drain Channel Roofing

Republic Steel Corporation, Cleveland, O., has developed a new roofing product now being introduced to the market under the trade name of Republic Perfected Triple Drain Channel roofing.

A chief feature of Triple Drain's construction lies in the use of four ridges and three valleys in each channel unit, thus providing three drainage channels instead of the conventional one or two. Because of this innovation, the company says neither driving rain nor capillary attraction (Syphoning or seepage) can cause leaks.

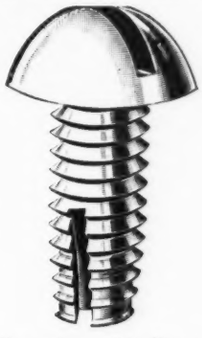


A beaded channel makes a tight fit at the overlapping edge, creating a vacuum action. Any rain passing this point is carried into the center channel through the action of gravity. For convenience, the proper area for nailing Triple Drain roofing is indicated clearly by blue lines on each sheet.

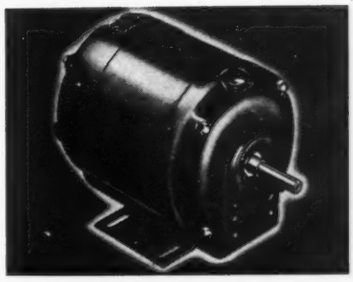
Triple Drain is available in three types of metal—steel, copper-bearing steel, and rust-resisting Toncan Iron. It is furnished in 26, 28 or 29-gauge.

△165—Thread-Cutting Screws

The Shakeproof Lock Washer Company, Chicago, has recently announced the development of a screw that actually cuts its own thread in metals



and plastics of practically any thickness. A free demonstration kit of Shakeproof thread-cutting screws, including an assortment of sizes and instructions for testing, may be had.



166—Motor Mounting

The Ohio Electric Mfg. Co., 5910 Maurice Ave., Cleveland, Ohio, announces the new Ohio Resilient Motor mounting.

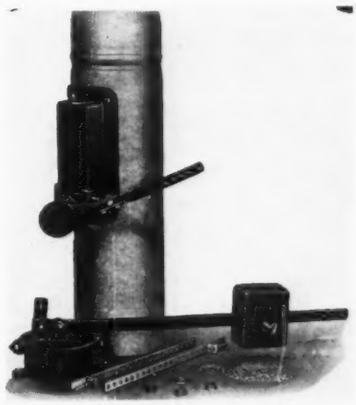
The cushioning rings are of ample size and are not affected by oil.

If desired, the motor may be removed by loosening the end pieces and without touching the base.

167—Surface Tank Regulator

Minneapolis-Honeywell Regulator Company, Minneapolis, Minn., announces a new arrival to the National line of automatic controls—Type M508 Surface Tank Regulator for coal or coke fired installations.

The construction of the regulator body provides for better contact with the pipe or tank to which it is attached, which in turn provides for quicker action of the regulator with better modulation of the damper. The regulator may be mounted on a vertical or horizontal line of pipe, or on the hot water tank itself. The advan-



tages arise from the unusual design of the "Metaphram" constructed of "Admiralty" brass. Three of these "Metaphram" diaphragms are included.

168—Heat-Aid

The Pyrolite Products Co., Refractory Engineers, of Cleveland, Ohio, announces Heat-Aid, a plastic furnace lining to reduce fuel costs. The company claims a fire bowl or firing chamber lined with Heat-aid gives approximately the same amount of radiated as reflected heat, thus obtaining better results with less fuel. It is applied by using a putty knife, small trowel or by hand. It is in putty form, packed in 5, 10, 50, 100, 200 and 500-lb. containers.

—News Briefs—

The Automatic Heating Co., 21 Ferris avenue, Highland Park, Mich., has been succeeded by the Automatic Heating & Cooling Co.

◆

Leonard T. Beecher, 408 Tenth avenue, West, Birmingham, Ala., has acquired an interest in the Southern States Iron Roofing Co., Savannah, Ga., and expansion of business will begin at once.

◆

A certificate to conduct business under the fictitious firm name of H. Herman Company, with a sheet metal shop at 5301 West Jefferson street, Los Angeles, has been issued to Morris Herman, owner, of 1030 North Martel avenue, Los Angeles.

◆

A certificate to conduct business under the fictitious firm name of Eagle Cornice & Sheet Metal Works, with a shop at 331 East Second street, Los Angeles, has been issued to the owner, Walter E. Hannan, of 416 West California street, Glendale, Calif.

Obituary

Henry Wand, St. Louis, Missouri, former sheet metal contractor died September 13, at Santa Monica, California, where he had resided for the past nine years. He was 72 years of age. Mr. Wand, who was president of the Wand and Niehaus Co., retired a few years ago.

◆

Ralph B. Hayward, president of the R. B. Hayward Co., Chicago, passed away recently from a heart attack while in Lockport, New York. Mr. Hayward organized the R. B. Hayward Company, sheet metal products manufacturers, in 1909, and has been active in the heating and ventilating industry since that time.

New Incorporations

The Superior Heating Co. has engaged in the heating equipment business at 2551 North Holton, Milwaukee, Wis.

◆

The Acme Metal Goods Co. Inc., has engaged in the metal products business at 350 S. W. Yamhill, Portland, Ore.

◆

J. Cardel has engaged in the air conditioning equipment business at 3703½ Perry avenue, Dallas, Tex.

◆

The Atlas Fixture Co. has engaged in sheet metal manufacturing business at 6692 Bock street, Oakland, Cal.

◆

The American Sheet Metal Co. has engaged in business at 3615 Ross avenue, Dallas, Tex.

◆

Gasconaire, Inc., 3255 Goldner avenue, Detroit, Mich., has engaged in the furnace and heating equipment business with a capital stock of $2,000.

◆

W. S. Kilpatrick & Co., composed of William S. and Louise H. Kilpatrick and Chas. H. Laws, has engaged in the air conditioning, heating and ventilation business at 1682 West Washington boulevard, Los Angeles, Calif.

◆

The Hannas Heat & Cold, Inc., 13 North Perry street, Pontiac, Mich., has been incorporated with capital of $25,000, of which $3,000 has been paid in, and will conduct an air heating and cooling business.

◆

The De Luxe Furnace and Wall Heater Company, Inc., has been incorporated in Los Angeles county, with a capital stock of $20,000. The directors are: Robert H. and F. Jean Morris and Bernadine Forwood, of Los Angeles. M. Lewis Lehman, attorney, represents the new corporation at 4307 Crenshaw boulevard, Los Angeles.

◆

Joe McQuaid has engaged in business in Portland, Ore., at 8335 S. E. 13th street, as Ace Heating Co.

◆

Kolz, Inc., has been chartered in Adrian, Mich., to deal in heating systems, etc. The capital stock is $7,500.

◆

The Rosen Iron & Metal Co. has engaged in business at 187 North Jefferson street, Milwaukee, Wis.

◆

The Standard Metal Corporation has been established at 1337 North Sixth street, Milwaukee, Wis.

◆

The E. Sugarman Co. has opened a new pipe and sheet metal business at southeast corner of 16th and Vermont, San Francisco, Cal.

◆

A. G. Elkins has engaged in the sheet metal business at 1222 East Burnside, Portland, Ore.

◆

The Isler Sheet Metal Works has engaged in business at 468 Front street, Coquille, Ore., under the management of Adolph Isler.

◆

The Luitink Manufacturing Co. has engaged in the manufacture of pressed metal business at 3374 W. Hopkins St., Milwaukee, Wis.

◆

The Philadelphia Sheet Metal Construction Co. has engaged in business at 240 Cherry street, Philadelphia, Pa., under the management of R. V. Moser.

◆

Vendel Canafax is to open a sheet metal plant at 2307½ Maple Avenue, Los Angeles, Calif.

◆

The Crown Furnace & Supply Company has been incorporated in Los Angeles county, with 2,500 shares of capital stock. Directors are: Wilmer Hinman, Karl L. Bedell and wife, A. Wilson and wife, all of Pasadena, Calif., and four others. The new corporation is represented by V. C. Collins, attorney, of 111 West Seventh street, Los Angeles.

◆

The Vortex Manufacturing Co. has engaged in manufacture of oil burners in Portland, Ore., with capital of $50,000. E. M. Bluhm, R. Ahlstrom and E. E. Goehler are among incorporators.

◆

The Reno Steel & Metals Corp. has been chartered in Los Angeles County, Cal., with a capital of $500,000, by William and Gilbert Reno, of Glendale, Cal., and Franklin J. Potter, Roy S. Gangstead and E. Laube, all of Los Angeles, Cal.

Removals

The Builders Sheet Metal Co., Seattle, Wash., has moved from 1716 Yale Avenue N. to 1933 Perry avenue.

The Acme Tin Shop, Dallas, Tex., has been moved from 2510 Knight street to 1618 Bryant street.

The Kinding Sheet Metal Works, Santa Rosa, Cal., has moved from 619 Second street to a new building on Santa Rosa Avenue.

The Oakland Sheet Metal Supply Co., Oakland, Cal., has moved into a new building at 2100 Poplar street.

The Metal Moulding Company has leased large space at 481 25th street, Oakland, Cal., for a new plant to have a distribution throughout northern California.

Plant Additions

The Seattle Iron & Metal Corporation, Seattle, Wash., is about to begin erection of warehouse and office building, to be served by a spur track.

◆

An addition which, with equipment, will cost $125,000, is to be built to the Houston, Texas, plant of the Rheem Manufacturing Co., makers of sheet metal merchandise and water heaters. The company, a Los Angeles concern, placed its Houston factory into operation in the early spring of 1937.

Ft. Wayne Code

(*Continued from page* 34)

of furnace installed as an integral part of said furnace, the whole being sold as a single unit, then the capacity or output in B. T. U. per hour available at the registers shall be determined by the following formula:

$$R = F \times C \times E$$

where
R—capacity or output in B. T. U. per hour at registers.
F—calorific value of fuel, B. T. U. per gallon.
C—combustion rate, gallons per hour.
E—overall efficiency, not to exceed 67 per cent.

Provided, however, that in any such oil burning furnace so installed, the ratio of heating surface (expressed in square feet) to oil input (expressed in gallons per hour) shall be not less than 40 to 1.

e. Gas Burning Furnaces, Conversion Type: Where a gas burner is to be installed in a furnace not specifically designed for the exclusive use of gas as a fuel such furnace shall be selected as provided in Section 29-a and Sub-Section 29-b of this ordinance as for solid fuel burning furnaces and with the additional requirement that the heating surface to grate area ratio of such furnace shall be not less than 20 to 1. Where such ratio is less than 20 to 1 the next larger size furnace shall be used.

f. Gas Burning Furnaces, Unit Type: Where a furnace is specifically designed for the use of gas fuel only and has one or more gas burners incorporated as an integral part of said furnace, the whole being sold as a single unit, then the capacity or output in B. T. U. per hour available at the bonnet shall be determined by the following formula:

Output Rating = 0.75 × Input Rating.

News Items . . . . . .

Air Conditioning Systems and Equipment

The value of orders booked by 125 manufacturers during July, 1937, for air conditioning systems and equipment totalled $5,800,617 as compared with $4,377,259 for July, 1936. June, 1937, totalled $7,440,019. The total for seven months—January through July—was $44,661,263 for 1937 as compared to $25,636,685 for 1936.

◆

Specialties Distributing Company, 5840 Woodward Avenue, Detroit, distributors for domestic refrigeration and stokers, has been appointed distributors for the State of Michigan for the Bertossa Power Heater, new furnace being manufactured by Jackson and Church, Saginaw, Michigan.

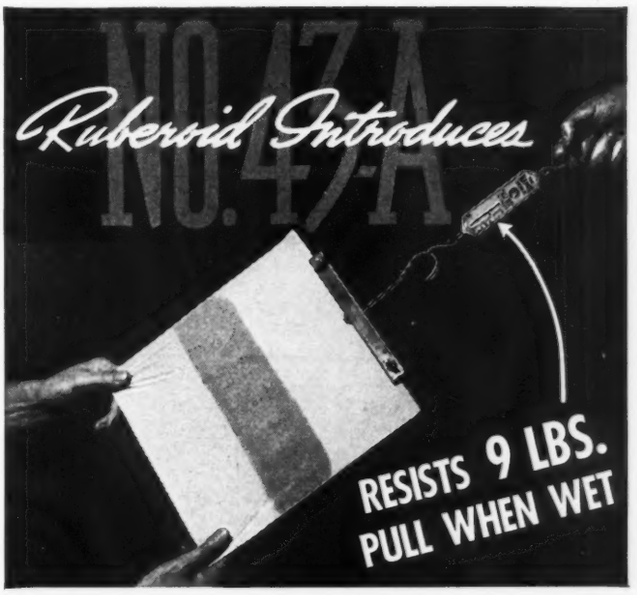
Sales and engineering for the furnace line will be under the direction of C. L. Lovejoy, who has been active in the heating industry throughout Michigan for the last ten years.

◆

Correction

The Disney-Leffel Company, Inc., has been chartered in Kansas City, Missouri, to handle air conditioning equipment, by M. A. Disney, Paul C. Leffel, and others. Authorized Capital, $20,000. This company was operated during the past four years under the same name as a partnership. They operate as exclusive distributors and manufacturers' agents for special accessory items. In the Kansas City territory they represent Barber-Colman Company, Bryant Heater Company, Independent Air Filter Company, Herman-Nelson Corporation, Young Regulator Company, Sterling Engineering Company and others.

In the September issue of American Artisan, this concern was referred to as the Bisney-Leffel Co., Inc., being chartered by R. C. Woods, James W. Woods and others.



New Asbestos Paper with remarkable strength, color and finish invites comparison . .

No.43-A is the name of a new Ruberoid-Watson Asbestos Paper that you should investigate. It offers tremendous advantages over ordinary asbestos paper for protecting air conditioning ducts and wood partitions, wrapping furnace pipes, and lining stoves, ovens and gas ranges.

No.43-A is thin and flexible, yet has unusual *wet strength* so essential when paste is applied. One side is rough for added adhesion—one side smooth, blue-white in color and water-repellent.

No.43-A contains in excess of 95% of pure asbestos fibres and no inflammable adulterants used as strengthening agents. You owe it to yourself to see this remarkable new product and test it. Mail coupon for free 5-foot sample.

RU-BER-OID R&W WATSON
Asbestos Papers

FREE THIS CANISTER CONTAINING 5 foot Sample

The RUBEROID Co., *Insulation Department*
500 Fifth Avenue, New York City

Send us your free 5-foot test sample of No. 43-A Asbestos Paper. We understand this places us under no obligation.

A.A. 10-37

*Name*_____

*Address*_____

*City*_____ *State*_____

Since Ruberoid sells through wholesale trade only, please give jobber's name.

New! SKILSAW DISC SANDERS

TWO POWERFUL MODELS FOR HEAVY DUTY AND CONSTANT PRODUCTION SERVICE

SKILSAW

• The compact streamlined design, power and engineering refinements of these two 7 in. SKILSAW Disc Sanders bring a new standard of performance to this field. Compare every feature and you will choose one of these tools for all grinding work now done by slow, costly hand methods. SEE THEM AT YOUR DISTRIBUTORS!

Here are the features of SKILSAW DISC SANDERS

Streamlined Body — Smooth, trim design, perfect balance and lighter weight make the tool easier to use. Comfortable grip handles give complete control under heavy sanding loads.

Straight-Line Ventilation—Assures a cool-running tool. Ports are located to blow dust away from operator and to prevent clogging. Efficient air-filter protects commutator and motor from abrasive dust and dirt.

Powerful Motor—Ample reserve power to insure long life. Provides for faster sanding and grinding.

Sealed Bearings — Ball bearings, in all positions, are fully sealed as a protection against dust and grease leakage.

Bevel Gearing — Sturdy and quiet in operation.

NEVER BEFORE SUCH QUALITY in the LOW PRICE DRILL FIELD!

DEFENDER DRILLS built by SKILSAW

• Not until SKILSAW brought out these two DEFENDER DRILLS has such a quality in construction and engineering been available in the low price field. Compare their specifications, power and drilling speed and you will see why DEFENDERS are the biggest drill "buy" on the market!

½ inch capacity in steel. No-load speed 400 R. P. M. Length 13½ in. Weight 9¼ lbs. $35.00

¼ inch capacity in steel. No-load speed 2000 R. P. M. Length 12 in. Weight 9¼ lbs. $19.50

EASY TO HANDLE COMPACT—LIGHT WEIGHT BEARINGS—Ball and Oilite Bronze — Self Lubricating. Provide constant lubrication and a hydraulic cushion for high pressure and shock loads.

MOTOR—Extra overload capacity insures cool running and longer life.

GEARS—Quiet special alloy steels, helically cut.

FRAME—Die-cast for strength and lighter in weight.

SKILSAW, INC. Dept. E, 3320 ELSTON AVE., CHICAGO
214 E. 40th St., New York 52 Brookline Ave., Boston
1429 Spring Garden, Philadelphia
312 Omar Ave., Los Angeles—2065 Webster St., Oakland

With the Manufacturers . . .

Eugene P. Farris

Eugene P. Farris, formerly with Emerson Electric Co., is now in charge of sales for "Home Comfort" Furnace & Mfg. Co., 2901 Elliot Avenue, St. Louis, Mo.

◆

New Prest-O-Lite Acetylene Plant

The Linde Air Products Company, Unit of Union Carbide and Carbon Corporation, announces the opening of a new Prest-O-Lite acetylene plant at 2330 Armistead Bridge Road, Norfolk, Virginia.

◆

Joseph O. Entrekin

Joseph O. Entrekin, vice-president in charge of sales of the Wheeling Corrugating Company, subsidiary of Wheeling Steel Corporation, died suddenly Saturday, September 11, at his home in Wheeling, West Virginia, following a heart attack.

◆

Allan D. Long, Jr.

Allan D. Long, Jr., 2927 Lothrop Ave., Detroit, has been appointed field representative for the eastern half of Michigan for Pyrolite Products Co., Cleveland, Ohio, handling the sale of their complete line of furnace cements, refractory, precast and insulating materials, according to an announcement of N. B. Radabaugh, manager.

◆

American Air Succeeds French

American Air Conditioning Corporation has been formed to take over the manufacture of the French automatic oil burners and oil burning furnaces and will also manufacture a line of air conditioning units, fan and filter cabinets, attic cooling fans and hot water heaters.

The company is capitalized at $250,000 and incorporated under the laws of the State of California.

◆

Moravec in Charge of Moline Office

J. G. Moravec, sales engineer, has been placed in charge of Penn Electric Switch Company's Moline office at 535 Fifth Avenue Building, Moline, Illinois, according to an announcement recently released by N. E. Jennison, assistant sales manager, Penn Electric Switch Co.

◆

Lincoln Sales Office in Sacramento

The Lincoln Electric Company, manufacturer of arc welding equipment, Cleveland, Ohio, announces it is now providing arc welding users in Sacramento and the central valley of California, complete arc welding sales and engineering service. The Lincoln Sacramento representative is William F. Fischer, address, 1241 32nd Street.

◆

Penn Announces Personnel Changes

Paul O. Penn, formerly manager of Penn Electric Switch Co.'s Detroit office, has been named assistant to Malcolm E. Henning, Penn executive vice-president, located at the company's new office and factory at Goshen, Indiana.

At the same time, Mr. Henning announced the appointment of P. L. Tolerton as manager of Penn's Detroit office. Mr. Tolerton, a graduate engineer, was for several years in charge of Penn's Chicago office.

◆

ABC Holds a Dealer Meeting

The Automatic Burner Corporation, Chicago, held a dealer meeting and dinner for its Eastern distributors and dealers at the Park Central Hotel in New York on August 20.

An interesting discussion on a new method of recruiting and training salesmen was presented by Ralph E. Caldwell, merchandising counsellor to the Automatic Burner Corporation. Joseph Hirsch, vice president and sales manager, acted as presiding officer of the meeting.

New pieces of advertising and promotional material were shown.

Ben Boalt Joins Perfex

The Perfex Corporation, 415 W. Oklahoma Place, Milwaukee, manufacturers of automatic controls, announces that Ben L. Boalt has joined the organization in the capacity of a vice president.

From 1931 until the present, Mr. Boalt was a director and vice president of Penn Electric Switch Company

◆

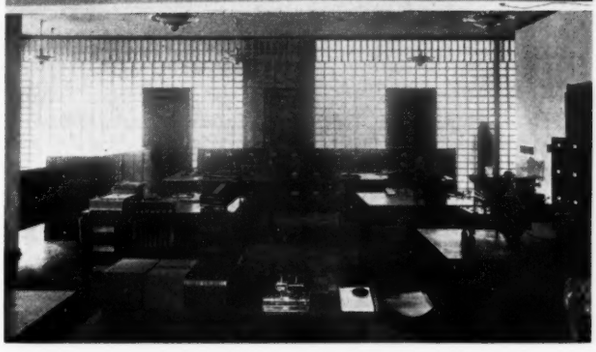
Mercoid Appoints New Distributor

The Loeffler-Greene Supply Company, Oklahoma City, Oklahoma, has just been appointed local distributor for automatic controls, sensatherms, thermostats, and the complete line of controls manufactured by the Mercoid Corporation, 4213 Belmont Avenue, Chicago, Illinois.

◆

Premier Completes Plant Addition

Premier Furnace Company, Dowagiac, Michigan, has recently completed an addition which includes a completely new office building, display room, and doubles the former warehouse capacity.



The exterior view shows the office in the foreground and the new warehouse section between the office and the former plant. The office interior view shows a portion of the general office desk space and illustrates the use of glass block partitions between the private offices and the general office.

◆

Automatic Anthracite Heat

Anthracite Industries, Inc., Chrysler Building, New York City, is advertising to the architects and builders and to the realty maintenance and mortgage department executives calling attention to the advantages and economy of automatic anthracite heat. The Field Organization offers to help with any problem affecting anthracite heating. The organization maintains a research and testing laboratory.

◆

Nelson B. Delavan

Delavan Engineering Co., Des Moines, will act as factory engineering sales representatives for a few companies in the seven states—Iowa, Kansas, Missouri, Minnesota, Nebraska, North and South Dakota—handling switches, heating and refrigeration equipment accessories, tools and electric specialties, selling to the specialty jobbers, contractors, resale original equipment manufacturers, industrials, power plants, and utilities.

Nelson B. Delavan, who heads this concern, was formerly a vice-president and director of sales with Penn Electric Switch Co.

"On 24 gauge and heavier,

WE BUILD A BETTER PRODUCT AT LESS COST with our LINCOLN WELDER"

"For the past year and a half, we have been making greater profits because of our Lincoln Arc Welder. We use it for fabricating clothes chutes, louvers, architectural and ornamental work, and many other products of stainless steel, black iron and galvanized material . . . metals as thin as 24-gauge.

"This Lincoln Arc Welder enables us to produce a neater, stronger, more rigid product, and by eliminating riveting, bolting and crimping, it speeds up our work and lowers our manufacturing cost.

"This little arc welder easily is the best investment we ever made in the way of shop equipment."

L. SOMMERFELD
Somaron Sheet Metal Works, Inc.
434-440 E. 165th St., New York City

You, too, will find this Lincoln Welder an extremely profitable investment. Mail the coupon for details.

THE LINCOLN ELECTRIC CO.

Largest Manufacturers of Arc Welding Equipment in the World

MAIL THIS COUPON TODAY

THE LINCOLN ELECTRIC CO.
Dept. EE-435, Cleveland, Ohio

Send a free copy of Bulletin 314 and details on the Lincoln "SA-150" Welder.

Name _____ Position _____

Company _____

Address _____

City _____ State _____

ANOTHER PEXTO PROFIT BUILDER

NUMBER 137

FOOT SQUARING SHEAR

Nominal Cutting Length	36 inches
Capacity, soft steel	18 gauge and lighter
Approximate shipping weight	650 lbs.

Latest design improvements . . . including FULLY ENCLOSED COMPRESSION SPRINGS that eliminate danger of spring breakage; NEW PRECISION REAR GAUGE with scales marked on each supporting rod for quick accurate adjustment; and TRUSS ROD on upper knife bar for extra rigidity and to maintain alignment of upper knife at all times . . . are some of the reasons why PEXTO SQUARING SHEARS are preferred equipment throughout the sheet metal working industry. This is only one of an unusually complete line of PEXTO Quality Machines and Tools for the modern sheet metal working shop. Write us for complete details on any item of interest.

THE PECK, STOW & WILCOX COMPANY

Since 1785

Southington Connecticut

New Literature . . . .

For your convenience in obtaining copies of new Literature, use the coupon on page 114.

245—New Vacuum Furnace Cleaner

Electric Vacuum Cleaner Co., Inc., 1734 Ivanhoe Rd., Cleveland, Ohio, is distributing a new bill insert or envelope stuffer covering the details of their new Premier furnace and boiler vacuum cleaner.

◆

246—Pulleys and Flexible Couplings

The Congress Tool & Die Company, Inc., 9030 Lumpkin Avenue, Detroit, is distributing a new 4-page catalog of Congress Standardized Drives—variable speed pulleys, "V" step cone pulleys, crown face pulleys and flexible couplings.

◆

247—Foot Operated Spot Welders

Acme Electric Welder Company, 5621 Pacific Boulevard, Huntington Park, California, has just published Bulletin No. 37 entitled "Spot Welders by Acme—Foot Operated Groups."

The company's complete line of foot operated spot welders is pictured and described. General capacity information and specifications are included.

◆

248—Stock List No. 37

The J. M. & L. A. Osborn Company, 1541 E. 38th St., Cleveland, Ohio, is distributing a combined Stock List—No. 37—for their three warehouses—Cleveland; 64 Rapin St., Buffalo; and 690 Amsterdam Avenue, Detroit.

This stock list is divided into twelve sections and indexed.

The company manufactures and distributes metals and metal products.

◆

249—Sound Motion Visualization of Heat

Johns-Manville, 22 East 40th St., New York City, has produced "Heat and Its Control" a sound motion picture filmed by Caravel Films, Inc.,—an actual visualization of what heat is, and the story of its use and methods of conservation—supplemented by a handbook entitled "Heat" which supplements the movie, covering approximately the same ground in greater detail.

"Heat" contains 48 pages, each of which has at least one illustration. These books will be given to each person attending a showing of "Heat and Its Control." The picture will be shown at engineering society meetings and at special showings to other interested groups.

◆

250—"The Welding of Enduro Stainless Steel"

Republic Steel Corporation, Cleveland, Ohio, announces "The Welding of Enduro Stainless Steel," a new 20-page booklet, profusely illustrated and describing in detail the proper methods for welding stainless steel by electric arc, gas, seam, spot, projection and atomic hydrogen methods. Included is information on brazing and silver soldering.

An interesting feature is a table showing in condensed form the physical, electrical and mechanical properties of thirteen of the more important types of Enduro stainless steel, contrasted with similar properties of a carbon steel, S.A.E. 1020.

◆

251—Metal Coating Literature

Metals Coating Company of America, 495 North Third Street, Philadelphia, Pa., originators and developers of the sprayed molten metal coating (Schoop) process, is distributing File Folder No. 1206 illustrating and describing their process; Bulletin 30-1930 devoted to Atmospheric-Corrosion; a reprint of an article entitled "Successful Metal Coating by the Spraying Process," by Dr. Leopold Pessel, Technical Director; Railroad Uses for MetaLayer; Metal Spraying Process in Electrical Manufacturing by John A. Campbell; and a reprint entitled "Production Operations on York Refrigeration Units with Hi-Cap MetaLayer.

In a Hurry. • PHONE, WIRE OR MAIL YOUR ORDER . . WE'LL SHIP IT THE SAME DAY

PRIME QUALITY **STEEL**

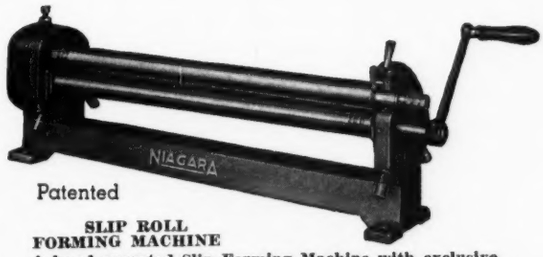
Bars • Shapes • Angles • Plates • Sheets • Tinplate

IN STOCK READY FOR IMMEDIATE SHIPMENT

Write for Our Stock List
Over 20 Years of Steel Service

BENJAMIN WOLFF AND COMPANY
58TH ST. AND SEELEY AVE. CHICAGO REPUBLIC 9100

IN YOUR SHEET METAL SHOP YOU



Patented

SLIP ROLL FORMING MACHINE
A hand operated Slip Forming Machine with exclusive features for facilitating production of metal pipes, cylinders from flat sheets and from blanks with previously folded edges.

You need this NIAGARA combination for Smooth Forming and Grooving

NIAGARA No. 260 UNIVERSAL GROOVING MACHINE
Capacity, 20 Gage—Working Length, 36 Inches

Compressing and offsetting previously folded and interlocked longitudinal edges of sheet metal cylinders or sheets to form inside and outside lock seams requires a grooving machine. This type of seam is almost universally used in making cylindrical products including pails, pipes, cans and other sheet metal articles. The Niagara Universal Groover shown at the left is one of the complete Niagara line built in various capacities and working lengths. They are built for convenient, rapid operation and available for hand, belt or individual motor drive. Write for Bulletins 76 and 77 giving complete information.

NIAGARA

Niagara Machine & Tool Works
683 Northland Ave. Buffalo, N. Y.

Manufacturers of Everything for the Sheet Metal Shop

Washington Letter

(*Continued from page* 25)

Federal Trade Commission. The Government aims to secure better control of trade practices in order to prevent unfair competition, deceptive and misleading or false advertising, price discrimination, combinations in restraint of trade, monopolies, systems like the multiple-basing-point system, and any other deceiving or unfair practice that is considered unfair to labor and unfair to industry and unfair to the consumer.

Price Setting Effect

There is a growing belief that the impending wage-hours bill will, in effect, wipe out the Tydings-Miller law which permits competitive industries and businesses in interstate commerce to fix prices on branded and trademarked goods. This law was passed late in the last session despite the President's opposition.

The Administration considers this law as a serious breach in the structure of antitrust laws. Unofficially, Government authorities hold that it may make possible the legalization of monopolies if the monopolies brand or trademark their products. It is assumed, of course, that the major object of a monopoly is to control the price at which its wares are sold. The Tydings-Miller law has thrown the entire antitrust philosophy of the Government out of kilter. It is the first break in the antitrust system in a quarter of a century.

Future Changes

The plan is to include in the new wage-hours bill regulations which may modify the monopolies that are based on patents; and monopolies, or trade practices, that are affected by tariffs. Donald Richberg, flaming star of the old NRA, is working with the group that has drafted the bill, and purposes to secure what he calls a "restatement" — which means revision—of all laws that affect trusts, monopolies, combinations, trade practices and any other custom of business or industry that has for its purpose collective or collusive objects.

The ultimate purpose seems to be, by some system such as is suggested in the O'Mahoney or the Borah licensing bill, to bring all business and industry under the control of the Government in order that business may be benevolently articulated for the greatest good of all those involved.

And Now—Monopolies

It has been suggested that like industries should be grouped in combinations and formed into what might be called monopolies, under Government control and supervision, functioning somewhat like the Bituminous Coal Commission. The latter absolutely controls the soft coal industry of the United States. It fixes prices, sets wages, and regulates the operation of the whole industry. In a sense it is a revival of a more closely organized NRA.

◆

Would you like to know some particular thing about Washington or legislation? Write us.—The Editors.

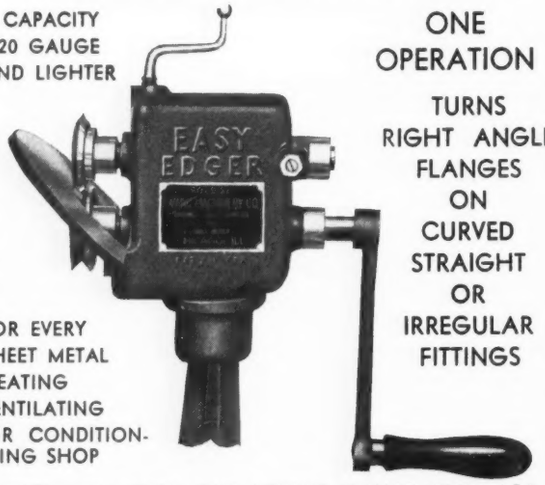
THE EASY EDGER

A FLANGING MACHINE THAT FLANGES IN—

CAPACITY 20 GAUGE AND LIGHTER

ONE OPERATION

TURNS RIGHT ANGLE FLANGES ON CURVED STRAIGHT OR IRREGULAR FITTINGS



FOR EVERY SHEET METAL HEATING VENTILATING AIR CONDITIONING SHOP

NOTE—WILL TURN ONE HEIGHT FLANGE ONLY ($\frac{7}{32}$)

MORE SIMPLE THAN A BURRING MACHINE | NO GAUGES TO ADJUST | SPEEDY ACCURATE UNIFORM EDGES

WRITE FOR DETAILS

WARD MACHINERY COMPANY
564 W. WASHINGTON BLVD.
CHICAGO ILLINOIS

FIRELINE *is your answer to ALL competition*

Selling New Furnaces

The public is finding out that to be strictly modern a furnace must be refractory lined. When competing with a factory-lined furnace, your only safe position is YOUR furnace with a Fireline lining.

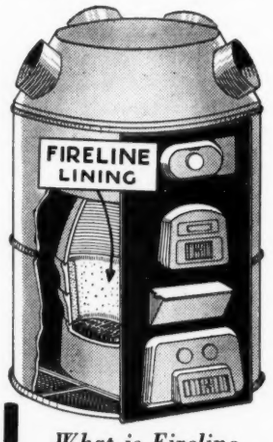
Repair Work

If it's price competition on a firepot replacement you can beat any new casting price by making the old one better than new. Fireline will repair even cracked and broken firepots—make them not only gas-tight but burn out proof.

Service Competition

If it's an emergency job you can give them heat the same day with Fireline—no heatless days waiting for castings. If it's a quality job, then by all means protect firepot castings OLD or NEW with Fireline and deliver up-to-the-minute efficiency. Home owners gladly pay well for Fireline for it pays them well.

Write for full information, prices, installation manual, and free sample.

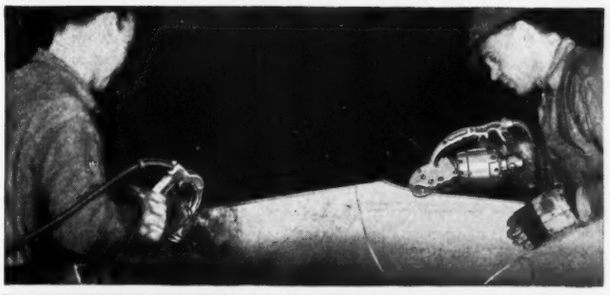


What is Fireline

Fireline is a new plastic firebrick material that is easily installed completely around the firepot wall to any thickness. It sets with an ordinary fire into an exactly fitting one-piece, gas-tight, firebrick lining. It makes fuel burn hotter, more completely, reduces smoke and soot, ends ash sifting, and cuts fuel bill from 10 to 20%.

FIRELINE STOVE & FURNACE LINING CO.
1866 Kingsbury St. CHICAGO, U. S. A.

STANLEY UNISHEARS



No. 16 UNISHEAR

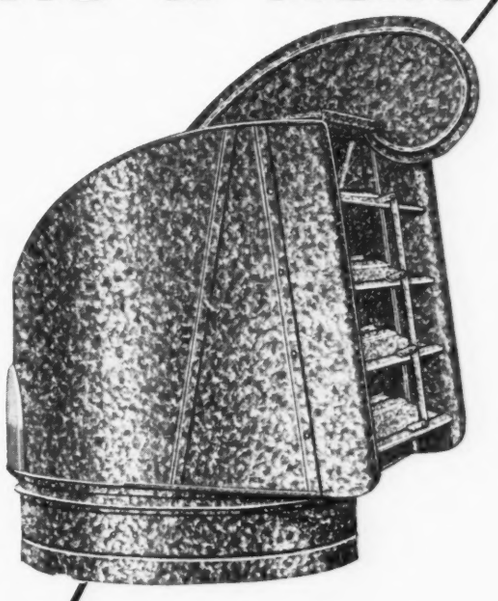
● If your sheet metal job demands the use of trimming dies for economical production, consider the possibility of using the Stanley Unishear. Pictured above is a No. 16 Unishear (capacity 16 gauge hot rolled steel) which has reduced the number of costly trimming dies used in the manufacture of all-steel automobile bodies in one large eastern plant.

● A Unishear goes right to the job — cuts as fast as you feed, without distortion of metal. Leaves smooth, finished edges. Follows any line, straight, curve or angle.

● Think of the points where Unishears can replace heavy, costly equipment in your daily production. Portable models with capacities of 18 to 14 gauge hot rolled steel; stationary models that cut up to ¼" boiler plate. Ask your distributor for a free demonstration, or write for Catalog 64M which describes these tools. Stanley Electric Tool Division, The Stanley Works, 131 Elm Street, New Britain, Conn.

STANLEY UNISHEARS
THE ELECTRICALLY DRIVEN HAND SHEARS

It's a "Honey"



Improved construction—
Greater capacity—
Modern lines—
Better looking—

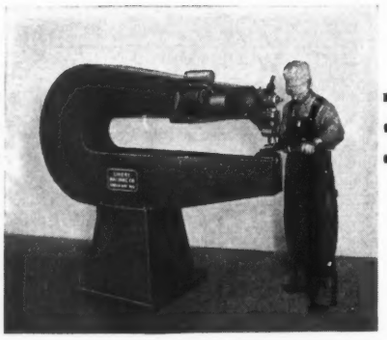
But *NO increase in price*—that, in few words, is the *NEW Swartwout Rotary*.

Rigid steel tubing welded frame—stainless steel fully enclosed ball bearings—and other features that help you to sell and which keep it "Sold"—and a trade discount to sheet metal contractors.

Write for folder and name of your district representative.

THE SWARTWOUT COMPANY
18615 Euclid Avenue
Cleveland, Ohio

The NEW Swartwout ROTARY BALL BEARING VENTILATOR

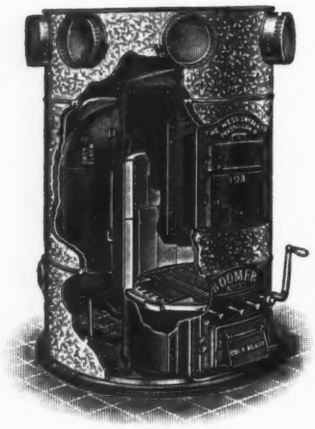


ONE LIBERT SHEAR—
Not Several Shears!

Meets all requirements for cutting IRREGULAR SHAPES—standard equipment furnished for ring and circle cutting . . . absolutely accurate and easily operated . . . metal is sheared and not punched . . . cut anywhere, no starting holes required for inside cutting . . . only one adjustment for various thickness of material used . . . unobstructed cutting vision . . . no further finishing required. No special cutters, pilots, templates, or strippers are needed . . . long life shear blades. Write for complete information.

LIBERT MACHINE CO. Green Bay, Wisconsin
Manufacturers of shears since 1915

Libert Method



Boomer Boiler Plate Furnaces

Also made with duplex grates and upright shaker.

Have been successfully made for 23 years. Where introduced have given satisfactory service. The fire pot liners are the best we can buy and we know of several Boomers that still have the original liners in, which are 23 years old. We have been making cast iron Boomers for 50 years.

If you are interested in selling a strictly high grade furnace, ask for prices and agency.

Nothing but the best of material enters into the making of Boomers.

When repairs are needed, avoid risk of dissatisfaction by ordering direct from the original patterns. Prices are low.

We sell to legitimate dealers only.

THE HESS-SNYDER CO., MFRS.
Massillon, Ohio

New Literature . . . .

For your convenience in obtaining copies of new Literature, use the coupon on page 114.

252—Testimonial Letters

Holcomb & Hoke Mfg. Co., 1545 Van Buren Street, Indianapolis, Ind., is distributing a series of nine testimonial letters regarding the FireTender stoker.

◆

253—Damper Control

Goese Manufacturing Co., 2548 N. 18th Street, Milwaukee, Wis., is distributing a 3½x6-in. envelope stuffer covering the Goese time saver damper control.

◆

254—Handy Furnace Pipe

F. Meyer & Bro. Co., Peoria, Illinois, is distributing Catalog 50 entitled "Handy Furnace Pipe." Duct work supplies are covered.

A new discount sheet applying to Catalog No. 50 is also available.

◆

255—Supplies in Canada

Peckover's, 77-79 Front Street, Toronto, Canada, is distributing a 60-page catalog of everything used in sheet metal work—sheets, sheet metal machinery and tools—including steel, brass, copper, aluminum, zinc, monel and nickel.

◆

256—Engine Driven Welders

Westinghouse Electric & Manufacturing Co., Dept. 5-N, East Pittsburgh, Pa., describe their engine driven welders, single operator, 200-300-400 amperes sets in a recent publication which includes performance curves of the welder, fuel consumption curves of the engines and general descriptions of the welders and power units.

◆

257—Armco Stainless Steels

The American Rolling Mill Company, Middetown, Ohio, has just issued a 26-page booklet on "Armco Stainless Steels—Chromium Nickel Grades." Uses of Armco stainless steels in many products are illustrated.

The booklet contains detailed information on heat treatment, drawing, punching and shearing, spinning, riveting, welding, electric and gas welding, soldering, brazing and pickling.

◆

258—Copper Shingles

The New Haven Copper Co., Seymour, Conn., is distributing a small folder entitled "The Roof of Today and Tomorrow—Kenmar Copper Shingles." Space is provided for the dealer's imprint.

Kenmar copper shingles are practical for the small house, they are architecturally attractive, easy-to-apply, and lower in cost than sheet copper. Other features are long life, no painting, repairs nor maintenance expense, salvage value, damp-proof as well as weatherproof, greater fire protection, lightening protection when properly grounded, eliminate snow guards, light weight.

◆

259—Guide for Sheet Metal Workers

United States Steel Corporation Subsidiaries, 434 Fifth Avenue, Pittsburgh, Pennsylvania, announces a new booklet, addressed to independent sheet metal fabricators, entitled "A Guide for Sheet Metal Workers."

This booklet, attractively printed in two colors, presents sales material and tables, as well as fabricating hints on USS Sheet Products, including USS Black and Galvanized, USS Terne and Tin Plates, and USS Stainless Steel.

There are a large number of photographs taken in typical fabricating plants and sheet metal shops, as well as lists of products which may appeal to the sheet metal worker who does a wide variety of jobs to order, such as building air conditioning ducts, tanks, trays, and conveyors.

SEE THE NEW PREMIER FURNACE CLEANERS

ONE HORSE POWER MODELS $84.50 and $89.50
HALF HORSE POWER MODELS $60.00 and $64.50

COMPLETELY EQUIPPED

Premier Furnace Cleaners are powerful and light weight, yet sturdily built to stand years of rugged service. Weighing less than 50 pounds, they are one-man cleaners and have been the furnace man's favorite for years. Premier Cleaners are ideal for upstairs use and may be used independently from the container for suction and blowing use in cleaning air ducts, registers, grills, radiators and air conditioning equipment.

Motor specifications for these powerful cleaners are:

1 H.P. maximum vacuum 46 inches in water.
½ H.P. maximum vacuum 31 inches in water.

Business-Getting, Return Post Cards are Available for Dealers at Low Cost

Buy It From Your Local Jobber or Write the Manufacturer

Furnace Cleaning Instruction Booklet Free with Each Cleaner

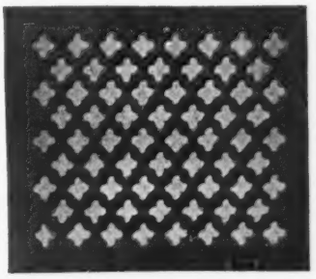
ELECTRIC VACUUM CLEANER CO., INC.
1734 Ivanhoe Road · Cleveland, Ohio

PERFORATED METALS

ARCHITECTURAL GRILLES

In Bronze, Steel, Stainless Steel, Monel, Aluminum, and other metals. Grilles of distinction for fine buildings in a wide variety of attractive designs. All of the standard and many original and modern designs are available in any metal, and of all dimensions, carefully made from selected stock. Grilles are but one of our specialties. We make Perforated Sheets of every type.

Pleasing Prices, Prompt Service



50 Years Experience Perforating Metals

The Harrington & King PERFORATING CO.

5649 Fillmore St., Chicago, Ill. New York Office, 114 Liberty St.

It sticks.....

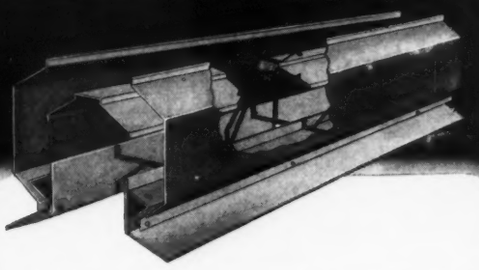
Like Fly-paper

KREHBIEL'S
FURNACE CEMENT

J. H. KREHBIEL CO.
425 No. Pulaski Rd. Chicago

BURT Monovent

Continuous Ridge VENTILATOR



Sheet metal men can make money selling Monovent. It is architecturally correct and affords roof ventilation at one-third less cost than unit ventilators. Easily installed on any type roof, any pitch . . . Burt Engineers will help you figure . . . Send for literature and prices.

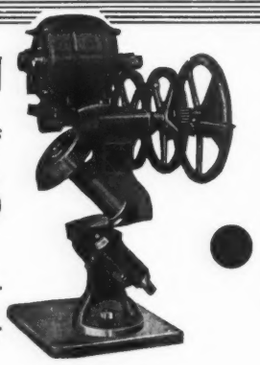
THE BURT MFG. CO.
Roof Ventilators • Oil Filters • Exhaust Heads

301 MAIN STREET AKRON, OHIO

MARSHALLTOWN

. . . for better throatless

SHEARS



Unquestionably better values for sheet metal workers, Marshalltown shears offer in addition to quality construction, faster and cleaner cutting. No up to date shop should be without a Marshalltown to really turn out the work and beat competition. Drop us a line today for literature and prices.

MARSHALLTOWN MANUFACTURING CO.

920 E. Nevada St. Marshalltown, Iowa

NU-DRY FURNACE CEMENT

"Best by Test"

There is one distinct advantage in using Nu-Dry Furnace Cement—you eliminate the risk of cracking, powdering or bloating when furnace is fired immediately after applied—it also withstands higher temperatures, does not shrink and keeps joints tight at all times. It is not affected by temperature changes, does not harden in containers and requires only half the usual amount of cement for a job.

FILL OUT COUPON FOR SAMPLE

PYROLITE PRODUCTS CO.
1221-31 W. 74th St., Cleveland, Ohio

Name .....

Address .....

Jobber's Name .....

Jobber's Address .....

New Literature . . . .

For your convenience in obtaining copies of new Literature, use the coupon on page 114

260—A Decade of Arc Welding

General Electric Company, 1 River Road, Schenectady, New York, is distributing an 8-page booklet entitled "The Arc Welding Development of a Decade" and featuring the new G-E mutator arc welder—an electronic rectifier for fabricating and repairing light-gauge metal.

261—Electric Hammer and Drill

Wodack Electric Tool Corporation, 4627 W. Huron St., Chicago, is distributing an envelope stuffer illustrating and describing the Wodack "Do-All," a combination electric hammer and drill used in masonry, metal or wood and which grinds, buffs and polishes.

262—F. A. Ducts and Fittings

The Excelsior Steel Furnace Co., 114 S. Clinton St., Chicago, is distributing a 19x25 in. blueprint of their forced air ducts and fittings for both round pipe and rectangular ducts. Detail drawings with styles, sizes and prices are included.

263—For Moderately Priced Homes

Dail Steel Products Company, Lansing, Michigan, is distributing a circular entitled "Smashing High Building Costs with a New Dailaire"—Pacemaker Model 116, intended for the moderately priced homes. The unit burns either oil or gas, and ranges from 80,000 to 110,000 Btu.

264—Unit Coolers

Perfex Corporation, 415 W. Oklahoma Place, Milwaukee, Wisconsin, is distributing a 8-page folder with description and specifications of their unit coolers using tap or well water below 60 deg.

A two-page folder with space for dealer imprint describes their portable cooler.

265—The House You Live In

Revere Copper and Brass Incorporated, 230 Park Avenue, New York City, is distributing a new booklet entitled "The House You Live In."

The booklet is divided into sections: Copper—its place in roofing; the water supply system; copper in heating and air conditioning; and additional copper and brass safeguards. Valuable information for both owner and sheet metal dealer is included in the 32 pages of the booklet.

266—Selective Motor Control

Hobart Brothers Company, Hobart Square, Troy, Ohio, has just released "More for Your Money," a new simplified arc welder bulletin featuring the company's new selective motor housepower control and the advantages of cutting current costs, improving power factor and reducing starting current.

The bulletin pictures jobs that can be done in a fraction of the time.

267—Activated Alumina

Aluminum Company of America, Pittsburgh, Pa., has just released "Activated Alumina, Its Properties and Uses," a 40-page spiral-bound booklet—5¼ x 8¼, in size.

Activated Alumina is manufactured by the Aluminum Ore Company of East St. Louis, Illinois, a subsidiary of the Aluminum Company of America. In general Activated Alumina may be employed for the dehydration of gases, vapors and liquids; as a desiccant; for the reclamation and reconditioning of oils; and as a dehydrating medium in air-conditioning equipment.

The text covers the grades, comparative dessicating properties, physical characteristics, adsorptive efficiency, construction of equipment, reactivation and applications, reclamation and reconditioning of oil, and air conditionng.

WHITNEY LEVER PUNCHES

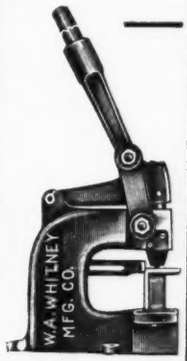
No. 4B PUNCH

Length—8½ inches. Capacity ¼-inch through 16 gauge. Deep Throat—2 inches. Weight—3 pounds. Punches and Dies — ⅛" to ⅜" by 64ths.

No. 6 PUNCH

Length — 26½ inches. Capacity — ¼-inch hole through ⅜-inch iron; especially adapted for button punching or templet work. Punches and dies ⅛" to ⅜" by 32nds.

No. 91 PUNCH



Capacity — ⅝-inch hole through ¼-inch, 1-inch hole through ⅜-inch and 2-inch hole through ½-inch iron. Depth throat 5-inches. Weight—82 lbs.

We have tools for every purpose needed by Sheet Metal Contractors.

Ask your Jobber

No. 1 PUNCH

Length — 34 inches. Capacity — ⅝-inch hole through ¼-inch iron. Punches and dies in sizes from ⅛ to ⅜ by 64ths.

No. 2 PUNCH

Length — 23 inches. Capacity — ⅜-inch hole through ¼-inch iron. Punches and dies in sizes ⅜-inch to ½-inch by 64ths.

CHANNEL IRON PUNCH

Companion to No. 2 Punch. Every part of the two Punches Interchangeable, including punches and dies. Capacity — ¼-inch hole through ¼-inch iron.

W.A. WHITNEY MFG. CO.
636 RACE ST. ROCKFORD, ILL.

IF IT'S REPAIR PARTS

to fit any Furnace, Boiler, Stove, or Air Conditioning Equipment, of any make or kind, that must fit exactly, and of course be of the finest quality, let Peninsular supply them. Buying from Peninsular is your assurance of perfect merchandise the first time and all the time . . . of immediate shipment, and prices that are right. Investigate! Try your next order with Peninsular.

PENINSULAR STOVE COMPANY
2699 Gratiot Ave. Detroit, Mich.

CLINTON

PERFORATED METAL

GRILLES *Are Accurate*

Clinton Grilles are made on the most improved machinery and with dies kept in good condition. The mechanics are skilled and accustomed to perforating the finest work. Clinton Grilles lie flat. There is never a spread, a warpage or buckle to consider. When your order specifies to a thirty-second of an inch, you get it. That is why Clinton Grilles always fit.

WICKWIRE SPENCER STEEL COMPANY

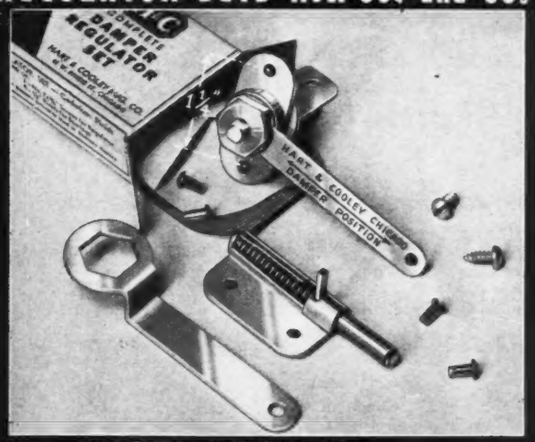
41 East 42nd Street, New York

Buffalo Worcester Chicago San Francisco

Clinton Grilles are regularly made in various gages of steel, brass, bronze, monel and Wissco Bronze, and are available up to 60" x 156" in all finishes. Send for the new GRILLE FOLDER that gives full information.

WICKWIRE SPENCER perforated metals

H&C *Improved* DAMPER REGULATOR SETS Nos. 50¼ and 50⅜



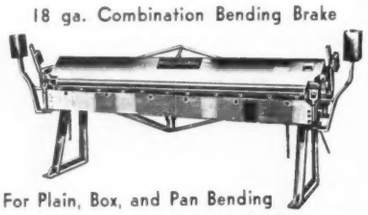
for NEAT, SECURE, CONVENIENT INSTALLATIONS

- Dampers are held securely, no turning, end-play or vibration.
- Can be installed in any position—on round or flat duct.
- Handle always indicates position of damper—may be removed to prevent tampering with adjustment.
- Threaded bearing has one-piece, unbreakable, steel shank—case-hardened to prevent wear—removable washer for easy riveting.
- Made in ¼-inch (No. 50¼) and ⅜-inch (No. 50⅜) sizes. ¼-inch snap end bearing permits easy installation of small dampers without bending. No. 50⅜ has solid end bearing. Wrenches furnished free.

HART & COOLEY MFG. CO., 61 W. KINZIE ST., CHICAGO

Whitney-JENSEN BRAKES

18 ga. Combination Bending Brake



For Plain, Box, and Pan Bending
Available in 5-6-8-10 ft. Sizes

Other WHITNEY-JENSEN BRAKES

•

12-14-16 ga. Combination 4-5-6-8-10 ft. Sizes

•

"AIR CONDITIONING SPECIAL" Portable Brake

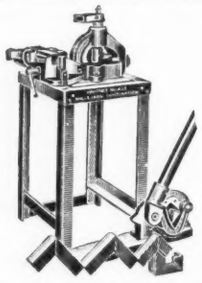
Floor or Bench Type 4 ft.—20 ga.

"THE TOOLS YOU NEED TODAY"

Nos. 7, 7½, 8—IMPERIAL ROLLER BEARING PUNCHES

• Ideal for standing seams, skylight work, and similar jobs. They punch AND STRIP inside 90°! Roller bearing, no cams, positive eccentric connection, easy-to-change punches and dies. Capacities, ¼" hole in ⅛", 3/16", and ¼" metal.

No. 455
Angle Iron Combination
SHEAR—NOTCHER—BENDER



• For fast, accurate cutting, notching, and bending of angle iron up to 2" x 2" x ¼". This complete unit is a handy tool to take out on the job or use in the shop. Combines three of our most popular tools on a sturdy stand.

Write for New Catalog
WHITNEY METAL TOOL CO.
91 Forbes St.
ROCKFORD • ILLINOIS

Now Ready---

The New Rock Island Register Catalogue

Shows Complete Line of "No-Streak" Registers for Gravity and Forced Air Installations.

Also many helpful Charts, Tables, Estimating Data—Prices. A catalogue every Dealer should have. Send Coupon for your copy today.

Rock Island Register Co.
Rock Island, Ill.

Please send me copy of your new catalogue.

Name .....

City .....

State .....

New Literature . . . .

For your convenience in obtaining copies of new Literature, use the coupon on page 114.

268—Properties of "K" Monel

The International Nickel Company, Inc., Development and Research Division, 67 Wall Street, New York City, has revised Bulletin T-9 entitled "Engineering Properties of 'K' Monel."

269—Repairs for Hot-Air Furnaces

The National Foundry and Furnace Co., 1144 Bolander Avenue, Dayton, Ohio, is distributing Price List No. 25—148 pages and cover—with instructions for ordering parts, return shipments, damaged castings, etc.

270—Increase Profits and Sales

Breuer Electric Mfg. Co., 864 Blackhawk Street, Chicago, Illinois, is offering a furnace and boiler cleaning sales plan for dealers, together with details of trial offer and terms on the Tornado furnace cleaner.

271—Manual and Training Course

Hobart Brothers, Hobart Square, Troy, Ohio, are distributing a revised edition of the Hobard Arc Welding Manual and Operator's Training Course—a valuable reference book. There is a small charge.

272—Furnace Fittings

The Cincinnati Sheet Metal and Roofing Company, Cincinnati, Ohio, is distributing a 24-page booklet (4¾ x 8¾ in.), entitled "Ajax" Furnace Fittings. Illustrations of the various fittings are followed by dimension tables and list prices at the bottom of each page.

273—Arc Welded Design

The Lincoln Electric Company, Cleveland, is distributing a wall chart of weld symbols for working drawings 24 x 37 in. in size, as adopted by The American Welding Society (1937). The chart may be oiled and blueprinted.

274—Home Ventilator

Schwitzer-Cummins Company, 1125 Massachusetts Avenue, Indianapolis, Indiana, is distributing an installation manual for the Schwitzer-Cummins home ventilator.

The home ventilator consists of a blower driven by a motor, a control which permits it to be started and stopped at will and a set of metal shutters for the attic opening through which the air is expelled.

A 5½x8 in. folder entitled "Don't Summer Suffer" is also being distributed. This folder describes the home ventilator and its advantages. An envelope stuffer with space for the dealer's imprint is also available.

275—Arc Welding Handbook

The Lincoln Electric Company, Cleveland, Ohio has just reprinted for the fourth time, "Procedure Handbook of Arc Welding Design and Practice," including the latest weld symbols adopted by the American Welding Society and a new introduction to part six, "Designing for Arc Welded Steel Construction of Machinery."

The new weld symbols occupy sixteen pages in the reprinted Handbook. The symbols are ideographic and their use, as applied to welded design drawings, is fully explained. In addition an example is given of how the symbols are actually applied in producing a welded design.

The Procedure Handbook of Arc Welding Design and Practice, now containing 839 pages and over 1,000 illustrations, is divided into eight principal parts:

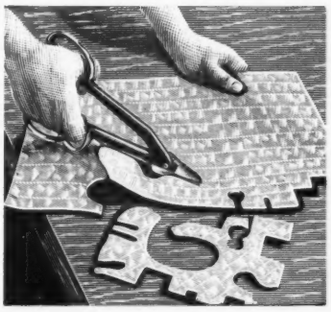
Part 1—Welding Methods and Equipment
Part 2—Technique of Welding
Part 3—Procedure, Speeds and Costs for Welding Mild Steel
Part 4—Structure and Properties of Weld Metal
Part 5—Weldability of Metals
Part 6—Designing of Arc Welded Steel Construction of Machinery
Part 7—Designing for Arc Welded Structures
Part 8—Typical Applications of Arc Welding in Manufacturing, Construction and Maintenance

The subject matter of the book is indexed in thirteen pages.

Furnace Repair Parts

Write for Catalogue.

BANNER REPAIR PARTS CO.
YOUNGSTOWN, OHIO



WISS
SCROLL-PIVOTER SNIP

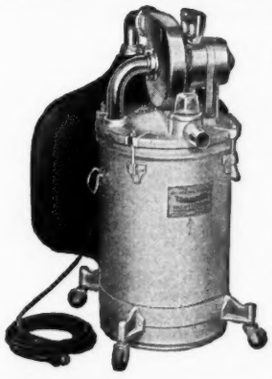
Cuts rings around other snips

Cuts circles, scrolls and squares as easily as a straight line will cut alloy steels.

Use Wiss Hy-power and Bulldog Snips

J. WISS & SONS CO.
Established 1848 Newark, N. J.

How to Sell Furnaces and Repairs
WITH
The TORNADO Furnace Cleaner



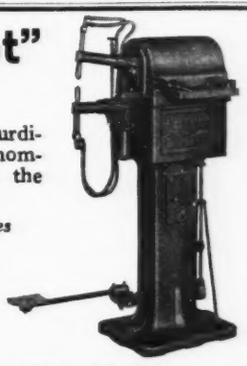
The TORNADO gets you into the basement where it is easy to sell repairs and new furnaces. And you make a profit on the cleaning job too!

Dealers say that the TORNADO is the most powerful furnace cleaner built. Leads the field! Low price—easy payments—free trial. Approved by Anthracite Institute and Underwriters Lab. Thousands in use.

Write now for complete information.

Breuer Electric Mfg. Co.
865 Blackhawk Street, Chicago, Ill.

ACME "Hot Spot" WELDERS



Universally accepted as the sturdiest, easiest handled, most economical electric Spot Welder on the market.

Write for literature and prices

Don't Rivet
SPOTWELD!
with an ACME
Lifetime Guarantee!

Complete range of sizes

ACME ELECTRIC WELDER CO.
Warehouses in principal cities
5619 Pacific Blvd. Huntington Park, Calif. (Los Angeles County)

Equals

1 lb. **20 lbs.**

Every pound of pressure on the handle of a Viking produces 20 pounds at the blade. Viking's original compound lever arrangement does it. Choose a Viking for its strength, long life, easy handling and low cost.

The cutting blade, ¼" thick, made of specially tempered high grade tool steel, keeps its edge for a remarkably long time and is easily replaceable. Write for complete details—buy from your jobber.

VIKING SHEAR CO. ERIE, PA.

for BOILER FURNACE AND STOVE REPAIR PARTS
A. G. BRAUER SUPPLY CO.
316 N. THIRD ST.
ST. LOUIS, MO.

KEEP OLD MAN WINTER ON THE RUN
XX TH CENTURY HEATING & VENTILATING CO.
AKRON, OHIO

SCHAEFER FURNACE and FLUE BRUSHES

Now is the time to stock Schaefer Brushes. Built for hard service in sizes to meet any requirement.

"Buy SCHAEFER—It's Safer."

Schaefer Brush Mfg. Co. 117 W. Walker St. Milwaukee, Wis.

IT SAVES YOU TIME

The uniform, close grain of Lyonore Metal retards corrosion, means greater tensile strength and easier workability. It may be formed into intricate shapes without flaking. Saves labor costs on any job. Ask for complete details.

LYON, CONKLIN & COMPANY, Inc.
Baltimore, Maryland

Lyonore Metal

CHROMIUM • NICKEL • COPPER • IRON ALLOY

THE FIRES DON'T NEED TO BE OUT TO CLEAN WITH THIS MACHINE

One Man Portable Powerful—De Luxe

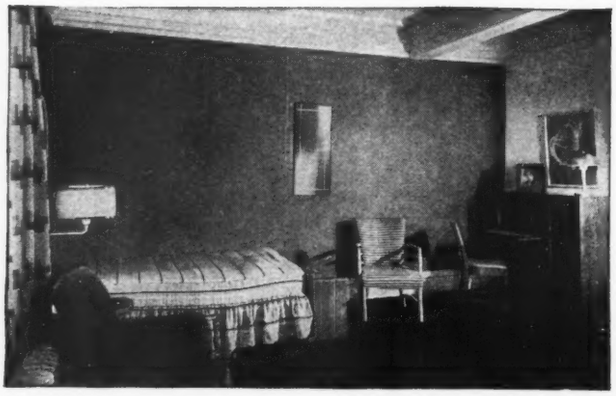
Manual tells how to easily get cleaning orders that lead to other business.

Write for details.

Free Trial—Easy Payment Plan.

Grand Rapids Furnace Cleaner Co.
225 Stevens St., S. W. Grand Rapids, Michigan

Modest or Pretentious—



WHETHER it be a single room (as above) or an elaborate suite, you will find Hollenden guest rooms modern and up-to-the-minute in decorations, equipment and furnishings. We are completing a modernizing program which make Hollenden guest rooms as fine as any to be found in Cleveland. The location is ideal, the service excellent, the food of the best and the prices moderate. Select the Hollenden on your next trip to Cleveland

HOTEL HOLLENDEN

A DeWitt Operated Hotel **CLEVELAND** *R. F. Marsh, Mgr.*

New Literature . . . .

For Literature, use the coupon on this page.

276—Soldering Flux

Burnley Battery & Mfg. Co., North East, Pennsylvania, is distributing a folder on their soldering paste, solution, salts and soldering stick. The company also makes a pipe joint compound.

◆

277—Three-Speed Conditioner

Viking Air Conditioning Corp., Cleveland, Ohio, is distributing a 4-page folder illustrating and describing their Viking 3-speed conditioner for forced air heating, ranging from 68,000 to 230,000 Btu capacity.

◆

278—Ten-Year Maintenance

International Heater Company, Utica, New York, and Chicago, Illinois, is using a window display card built around a ten-year maintenance agreement in connection with the Economy Blue Front Furnace. "Kept in repair at no cost for 10 years" is intended as a powerful sales argument for their dealers.

◆

279—Golden Rod Blowers

F. Jaden Manufacturing Co., Inc., Hastings, Nebraska, is distributing an 8-page circular covering their Golden Rod blowers—package, filter, utility, base and twin types. A page is devoted to a description and illustrations of the various features. Tables of capacities and suggestions for selecting size are given.

◆

280—Dealer Advertising

Fireline Stove & Furnace Lining Co., 1800 Kingsbury Street, Chicago, Illinois, has recently prepared a series of newspaper mats for use by the furnace dealer to advertise his services in his local newspapers. While these ads include information on Fireline for lining firepots, they devote considerable space to the furnace man's other work. A folder showing proofs of these advertisements is offered.

◆

281—National Weather Week

Taylor Instrument Companies, Rochester, N. Y., is sponsoring "National Weather Week," November 6 to 13. Briefly, it is a nation-wide cooperative campaign to stress "Prepare Now for Winter." The purpose is to stimulate the sale of winter merchandise. Window displays are free to participating stores, as well as counter displays, store posters, window streamers, newspaper layouts, mats for store advertisements, stickers, a free question and answer game on weather for consumers, an educational pamphlet for salespersons, store publicity for radio newspaper use, and merchandising idea booklets for store executives. The emblem is intended to furnish a frosty keynote.

FOR YOUR CONVENIENCE

American Artisan, 6 N. Michigan Ave., Chicago, Ill.

Please ask the manufacturer to send me more information about the equipment mentioned under the following reference numbers in "New Products" and "New Literature." (Circle numbers in which you are interested):

150	151	152	153	154	155	156
157	158	159	160	161	162	163
164	165	166	167	168	169	170
245	246	247	248	249	250	251
252	253	254	255	256	257	258
259	260	261	262	263	264	265
266	267	268	269	270	271	272
273	274	275	276	277	278	279
280	281					

Name..... Title.....

Company .....

Address .....

Are you Manufacturer——Jobber——Dealer——

PORTABLE SHEARS

ALL-ALLOY

ALL-ALLOY No. 2 cuts up to ¼" steel plate.
ALL-ALLOY No. 1 cuts up to No. 11 gauge strip or sheet.
Special blades may be had for shearing stainless steel.

FULLY GUARANTEED

BREMIL MFG. CO. Erie, Pa.

RYERSON

IMMEDIATE SHIPMENT FROM STOCK

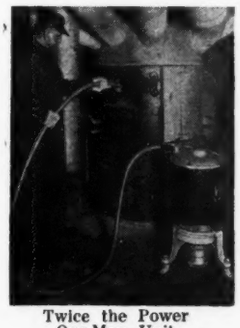
More than twenty kinds of prime quality sheets are carried in stock. There is a special sheet for every purpose. Also Bars, Angles, Rivets, Bolts, Tools and Metal-Working Machinery.

Write for Stock List

JOSEPH T. RYERSON & SON Inc

CHICAGO DETROIT MILWAUKEE ST. LOUIS JERSEY CITY CINCINNATI BUFFALO CLEVELAND PHILADELPHIA BOSTON

SHEETS



Twice the Power One-Man Unit

Clean Up!—

with

KENT

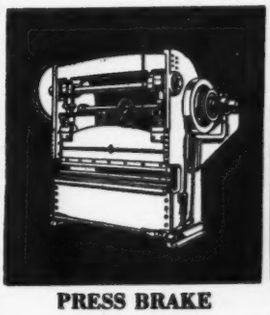
DOUBLE SUCTION

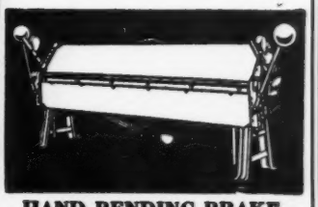
With the KENT you:
CLEAN MORE QUICKLY
HAVE FEWER REPAIRS
DO A BETTER JOB IN LESS TIME
EARN MORE PROFIT

Investigate the KENT. Write today!

167 Canal Street

THE KENT COMPANY, Inc., Rome, N. Y.





CHICAGO

PRESS BRAKE **HAND BENDING BRAKE**

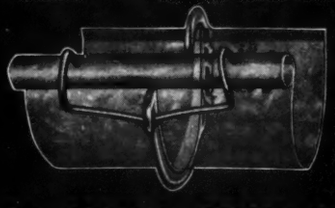
Steel Brakes—Presses—Shears

DREIS & KRUMP MFG. CO.

7404 LOOMIS BLVD. CHICAGO

"BB" QUALITY

Order from your jobber



Saves time and labor

"BB" SPRING CIRCLE CLIP

Furnished only with "B B" Circles at no extra charge over old style straps.

BERGER BROTHERS CO.

229-237 Arch Street, Philadelphia, Pa.

SAVE BY ORDERING

FURNACE REPAIRS

MADE WITH

TO FIT A PRODUCT OF CHRONAT IRON RESISTS WEAR AND FIRE THE NATIONAL FOUNDRY & FURNACE CO. **ANY FURNACE**

"MADE TO FIT THE JOB"

THE NATIONAL FOUNDRY & FURNACE CO.

STA. B. DAYTON, OHIO

Victor heating equipment is a line that enables you to buy all your requirements from one reliable source.

This Victor demonstrator enables Victor dealers to close sales at a profit. Investigate this money making line. Write or wire.

HALL-NEAL FURNACE CO., Indianapolis, Ind.

JUST SO

YOU'LL REMEMBER

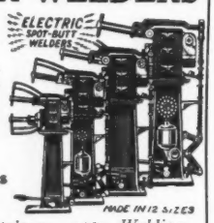
We made the can as big as our economical little ad will allow. The little ad is typical of Burnley's paste—a little goes a long way. Your nearest Jobber carries Burnley Fluxes—"if he knows his fluxes." Write for sample today.

Burnley Battery & Mfg. Co • North East, Pa.
Soldering Paste, Salts, Solution, Stick

AMERICAN ARTISAN Service Section

G. A. VOORHEES
CONSULTING ENGINEER
FORCED AIR HEATING AND WINTER AIR CONDITIONING
633 S. Delaware St. Indianapolis

FURNACE REPAIRS
A wide and diversified line of grates with many original parts.
EXCELLENT SHIPPING FACILITIES
Write Today for Catalog
C. ARTHUR MILLER & SON
202 So. Main St. Dept. 9 Elmira, N. Y.

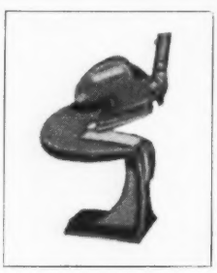
Weld With **EISLER WELDERS**
SPOT WELDERS
BUTT • WIRE SEAM
A. C. ARC WELDERS
Welders as low as $25.00


Ask for 38-W Catalogue—1250 Welding Illustrations.
Submit Samples for Test. No Obligation
EISLER ENGINEERING CO., Inc.
761 S. 13th St. NEWARK, N. J.

"DO-ALL" Combination Electric Hammer & Drill
drills both concrete and metal. Cap. 1½" in concrete—⅜" in metal. Saves time and money in setting expansion bolts, anchors and plugs. Soon pays for itself. Easy to maintain. Bulletin 371. Wodack Elec. Tool Corp., 4644 W. Huron St., Chicago, Ill.

For Arc Welding Stainless
use
Universal "Stainarc" Electrodes
Welds 18 and 8 Stainless Sheets 22 gauge and heavier. Ideal for all fabrication requirements.
5 lb. lots $2.75 per pound shipped postpaid on receipt of check.
UNIVERSAL POWER CORP.
Dept. 310
4300 Euclid Ave. Cleveland, Ohio

WRITE FOR PARTICULARS
About the
BAKER FURNACE CLEANER
BEFORE YOU BUY
Machine and Big Bag sets in yard to do the work. Giving Advertising Advantage and Customer Appeal. Low Price. Easy Terms.
BAKER FURNACE CLEANER MFG. CO.
2505 Albion Toledo, Ohio


BEVERLY THROATLESS SHEARS
are indispensable to the modern, up to date sheet metal shop. Light, portable, yet extremely strong, they will make your shearing operations much faster, neater and more economical thru time saved on the job. They are made in two sizes to handle up to 14 or 10 gauge metal and are very reasonably priced.
Write today for literature and prices.
BEVERLY THROATLESS SHEAR CO.
3009 W. 110TH PLACE. DEPT. 3. CHICAGO

"THARCO"
CEMENTS FOR EVERY HEATING PLANT PURPOSE
When ordering heat resisting materials for furnaces, stoves, or boilers, order "THARCO" Asbestos Furnace Cement, Asbestine Stove Putty, Asbestine Boiler Putty, Hi-Heat Putty, and Retort Cement. To be doubly sure of materials that will do every job perfectly, use "THARCO."
THE ARMSTRONG CO.
Post Ave. and South St., Detroit, Mich.
Reliable Mfrs. of Plastic Cements for Over ¼ Century

FOR SALE:
Used Arco Wand Furnace and Boiler Cleaner (Trailer Type). Excellent condition. Bargain. Carl E. Swift Corp., Holland, Michigan, Manufacturers of the World's Largest Electric Furnace and Chimney Cleaner.

ARREST YOUR ATTENTION
To qualify for more and bigger Sheet Metal and Heating jobs in 1938.
We have a special Training Service for Employers, their sons, Mechanics, Apprentices, etc. Each Student is trained in as personal a way as possible in Laying Out, Plan Reading, Figuring, Designing jobs, Estimating and Supervision of the work. This is Your Key to open the door of Opportunity. Our Courses are specially prepared for Home Study Instruction.
Information is free, no obligation, write today for subjects interested in.
☐ S-M Design and Pattern Drafting.
☐ Forced Air Heating & Air Conditioning.
☐ Mechanical Air Conditioning, Refrigeration.
☐ Heating-Ventilating Engineering.
☐ Estimating and other Courses.
ST. LOUIS TECHNICAL INSTITUTE
O. W. Kothe, Director
4541 Clayton Ave. St. Louis, Mo.

Free AIR CONDITIONING AND REFRIGERATION TRIAL LESSON

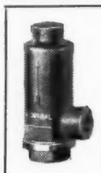
A fast growing field of opportunity. Trained men are needed. Learn the easy C. T. C. way.
AT HOME IN SPARE TIME AT LOW COST
Write today for FREE TRIAL LESSON
CHICAGO TECHNICAL COLLEGE
N340 Tech. Bldg., 118 E. 26th St., Chicago, Ill.
If you can go away to college to learn Air Conditioning, Engineering Architecture, Drafting, Electricity or Radio, send for FREE Blue Book.

DO YOU KEEP A GOOD SET OF BOOKS?
Bookkeeping systems installed by National expert accountants present the most systematic accounting control with a minimum of records and clerical work. State and Federal tax laws require contractors to keep a complete set of books. Penalties inflicted for not complying are heavy.
Our staff includes men who have been employed by the government and are well informed on any tax situation that may arise. **Don't delay,** a good set of books is yours by writing or calling for our service. Our rates are reasonable.
NATIONAL ACCOUNTING SERVICE
180 W. Washington St., Chicago, Illinois
Phone Franklin 3283

"Ralpo" Sheet Metal Cutter

For cutting flat, formed or corrugated sheet metal, straight or circular, 16 gauge and lighter without distorting or burring.
Inexpensive, it is a real time and money saver. Priced at $2.50, remittance with order delivers it anywhere in the U. S. Drop forged and Rockwell tested. Ask your jobber.
RALPH W. POE • CANTON, ILL.
P. O. Box 159

PATENTS AND TRADE MARKS
Philip V. W. Peck
Barrister Bldg., Washington, D. C.


STRAINERS for AIR CONDITIONING REFRIGERATION OIL BURNERS
Write for Catalog
Central Brass Mfg. Co.
Cleveland, O.

SERVICE SECTION: Rates for display space similar to above in Service Section are $5.00 per inch per insertion. One-inch minimum space accepted. **Classified Section:** Rates for classified advertising are 5 cents for each word including heading and address. Count seven words for keyed address. Minimum $1.00 for each insertion. Cash must accompany order.

Classified

SITUATION WANTED

Heating and Air Conditioning lines desired for Oklahoma territory. Fifteen years' experience in jobbing field. Well acquainted with contractors and architets. Write Key No. 418, American Artisan, 6 N. Michigan Avenue, Chicago.

Manufacturers Agents

MANUFACTURERS WANTING ADditional representation often come to us for names of prospective agents now handling other lines in this field on a commission basis in a definite territory. It will pay you to be on record with us so we can refer your name to interested manufacturers. No charge or obligation, of course. It is a service we render free to manufacturers and representative. Just drop a line that you are interested in being on file and we will send you form to fill out. Address American Artisan, 6 N. Michigan Ave., Chicago, Ill.

JOHNSON'S
NEW HANDY MANUAL
on
HEATING, VENTILATING
MECHANICAL REFRIGERATION
and
AIR CONDITIONING

432 pages of practical, condensed information, tables, rules and diagrams. Price $1.00 — Remit with order to

KEENEY PUBLISHING COMPANY
6 N. Michigan Ave., Chicago, Ill.

The new American Artisan Service Section presents a golden opportunity to contact a national circulation at comparatively small cost. Manufacturers can use it to make any article sell and dealers will find it an inexpensive way to contact a live buying trade. Don't delay—send in your copy now for the next issue. See bottom of page for rates.

Use AMERICAN ARTISAN Classified Advertising for quick results. It puts you in direct touch with the buyers and sellers in the warm air heating, sheet metal contracting and air conditioning industry.

AMERICAN ARTISAN Service Section

Sheet Metal Machines
New and *Really Rebuilt*

A machine for every use and every machine is ready for use. The largest stock in Chicago. Ask for list.

Complete supplies and tools.

MAPLEWOOD MACHINERY CO., Inc.
Chicago

2634 W. Fullerton Ave. Brunswick 9200
561 W. Washington Blvd. State 1405

VENTILATING EQUIPMENT
Everything in Exhaust Ventilation
HEAT—SMOKE—FUMES
Gravity and Fan Ventilators
Write for Information and Advice
PAUL R. JORDAN & CO.
631 S. Delaware St., Indianapolis, Ind.

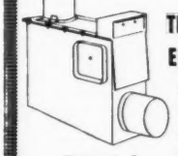
BUY ALL OR PART
COMPLETE SHEET METAL SHOP

Hollow Mandrel Stake	$ 5.50
Beakhorn Stake	10.00
Blowhorn Stake	6.00
Large Turning Mach. 3" rolls	10.50
Chgo. Steel Slitter	8.50
No. 2 Whitney Hand Punch	8.50
No. 10 Whitney Hand Punch	10.00
18 Ga. Marsh. Throatless Shear	22.50
Beverly Throatless Shear 14 ga.	15.00
Comb. No. 0585 Pexto Crimper & Beader B. G. 20 ga.	15.00
10 ft. 16 ga. Chgo. Steel Brake	250.00
10' Elec. City Gutter Forming & Beading Machine with forms	100.00
¼" Black & Decker Elec. Drill	15.50
30" 18 ga. Pexto Foot Shear, all ga.	65.00
Wagner Brake Slitter	15.00
8' 18 ga. Chgo. Steel Brake	125.00
30" Pexto Bar Folder	35.00
36" x 2" Slip Roll	25.00

INTERSTATE MACHINERY CO., INC.
107 S. Clinton St., Chicago
(Free Parking)

THIS BEAR TRAP IS PRETTY GOOD AT CATCHING BEARS

AND—



Patented

THIS CONDENSATION ELIMINATOR . . . .

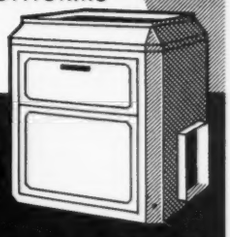
is just as good at trapping excessive moisture which would otherwise cause chimney cracks, salt deposits, necessitating repairs and sometimes stack replacement. Specify the Condensation Eliminator on all installations.

CONDENSATION ENGINEERING CORPORATION
335 S. Western Ave., Chicago, Illinois

Robert Barclay INC. OIL BURNER SUPPLIES

DEALERS SAVE MONEY by writing for Barclay's bargain catalog of all installation accessories and replacement parts for oil burners, stokers, forced air and automatic heating. 4 hour shipment. **ROBERT BARCLAY, INC.,** 128 N. Peoria Street, Chicago, Illinois.

AIR BRUNDAGE SYSTEMS CONDITIONING



Write for New Literature on BRUNDAGE Air Conditioning Equipment..

The BRUNDAGE COMPANY
KALAMAZOO MICHIGAN

RIBBED WIRE GLASS - 13c per SQ. FT.
STOCK SHEETS, CASE LOTS, PLUS BOXING F. O. B. BUFFALO, N. Y. SHIPMENT TO ANY PART OF THE UNITED STATES
QUOTATIONS ON ALL KINDS OF GLASS ON REQUEST
Write for Samples
T. J. ATCHESON GLASS CO.
953 Main St., Dept. A, Buffalo, N. Y.

IT'S CHIMNEY TOP TIME

Accurate Revolving Ventilators MAKE GOOD CHIMNEY TOPS. POSITIVELY PREVENTS DOWN DRAFT. Will please your most exacting customer. Low Priced.

SEE YOUR JOBBER TODAY OR WRITE US DIRECT

ACCURATE MFG. WORKS
2432 MILWAUKEE AVENUE
CHICAGO

Soot Vanishes Instantly With E-Z Fuel Oil Soot Destroyer

All the soot in the fire chamber disappears instantly when sprayed with E-Z. There is no easier way to remove soot. Try it. Send your order today to the address below.

No. 1 Package	**$0.90**
No. 5 Package	**4.05**
Spray Gun	**.75**
16 envelope package for oil burning stoves, etc.	**1.00**

Healy-Ruff Company
814 Hampden Ave., St. Paul, Minn.

SERVICE SECTION: Rates for display space similar to above in Service Section are $5.00 per inch per insertion. One-inch minimum space accepted. **Classified Section:** Rates for classified advertising are 5 cents for each word including heading and address. Count seven words for keyed address. Minimum $1.00 for each insertion. Cash must accompany order.

Index to Advertisers

Firms represented in this issue are identified by the folio of the page on which their advertising appears.

October, 1937

Accurate Mfg. Works.....117
Acme Electric Welder Co.....113
Acme Heating & Ventilating Co. 77
Aerofin Corp. 75
Air Conditioning Division, Auburn Automobile Co..... 3
Air Controls, Inc..... 71
Aire-Foile Fan & Blower Co... 92
Aldrich Co. 87
Allen Corp. 89
American Air Filter Co., Inc. 46
American Brass Co.....9 and 40
American Rolling Mill Co., The 15
Anthracite Industries, Inc..... 41
Armstrong Co., The.....116
Atcheson Glass Co., T. J.....117
Auer Register Co..... 12
Autocrat Oil Burner Corp..... 91
Automatic Humidifier Co..... 88
Automatic Products Co..... 81

Banner Repair Parts Co.....113
Barber-Colman Co. 87
Barber Gas Burner Co., The.. 42
Barclay, Inc., Robert.....117
Belanger Fan & Blower Co.... 91
Berger Bros. Co.....115
Bertossa Div., Jackson & Church 72
Beverly Throatless Shear Co...116
Brauer Supply Co., A. G.....113
Bremil Mfg. Co.....115
Breuer Electric Mfg. Co.....113
Brundage Co., The.....117
Buffalo Forge Co.....
.....Inside Back Cover
Burnley Battery Co.....115
Burt Mfg. Co..... 109

Central Brass Mfg. Co.....116
Century Electric Co..... 37
Century Engineering Corp..... 44
Chalmers Oil Burner Co..... 85
Chandler Co. 91
Chicago Technical College....116
Clarage Fan Co..... 85
Condensation Engineering Corp.117
Congress Tool & Die Co..... 88
Cook Electric Co..... 84
Crise Electric Mfg. Co., The.. 43

Detroit Lubricator Co..... 52
De Witt Operated Hotels.....114
Dreis & Krump Mfg. Co.....115

Econocol Stoker Co..... 89
Eisler Engineering Co.....116
Electric Vacuum Cleaner Co., Inc. 109
Excelsior Steel Furnace Co.... 90
Elgo Shutter & Mfg. Co..... 91

Fireline Stove & Furnace Lining Co. 106
Fox Furnace Co., The 49
Furblo Co. 87

General Electric Co..... 69
Gleason-Avery, Inc. 87
Goese Mfg. Co..... 91
Grand Rapids Furnace Cleaner Co. 114

Hall-Neal Furnace Co.....115
Harrington & King Perforating Co. 109
Hart & Cooley Mfg. Co...6 and 111
Healy-Ruff Co. 117
Henry Furnace & Foundry Co., The .....78 and 86
Hess-Snyder Co. 108
Hess Warming & Ventilating Co. 70

Illinois Testing Lab., Inc..... 92
Independent Register Co., The 8
International Engineering, Inc. 90
International Nickel Co., Inc... 5
Interstate Machinery Co.....117

Jaden Mfg. Co., F..... 85
Johnson Co., S. T..... 50
Jordan Co., Paul R.....117

Kent Co., Inc.....115
Krehbiel Co., J. H.....109

Lau Blower Co..... 79
Libert Machine Co.....108
Lincoln Electric Co.....103
Lochinvar Corp. 81
Lyon-Conklin & Co.....114

Maid-O'-Mist, Inc. 74
Maplewood Machinery Co.....117
Marshalltown Mfg. Co.....110
Maurey Mfg. Co..... 92
Mercoid Corp., The.....
.....Inside Front Cover
Meyer & Bro. Co., F..... 14
Michigan Tank & Furnace Corp. 17
Milcor Steel Co.....
.....Outside Back Cover
Miller & Son, C. Arthur.....116
Minneapolis-Honeywell Regulator Co. 93
Monmouth Products Co..... 45
Morency-Van Buren Div., Scovill Mfg. Co..... 73

National Accounting Service..116
National Fan & Blower Corp... 91
National Fdry. and Furnace Co.115
Niagara Machine & Tool Works105
Nu-Way Corp., The..... 83

Ohio Electric Mfg. Co..... 91
Osborn Co., J. M. & L. A..... 18

Pacific Gas Radiator Co..... 76
Parker-Kalon Corp. 10
Patent Novelty Co..... 86
Payne Furnace & Supply Co... 75
Peck, Philip V. W.....116
Peck, Stow & Wilcox Co.....104
Peerless Electric Co..... 89
Peerless Foundry Co..... 80
Peninsular Stove Co.....111
Penn Electric Switch Co..... 51
Perfex Corporation 48
Practical Instrument Co..... 90
Premier Division, Electric Vacuum Cleaner Co., Inc.....109
Pyrolite Products Co.....110

Randall Graphite Products Corp. 89
Refrigeration and Air Conditioning Institute 94
Revere Copper & Brass, Inc... 11
Rock Island Register Co.....112
Round Oak Co..... 79
Ruberoid Co. 101
Rudy Furnace Co..... 92
Rybolt Heater Co..... 83
Ryerson & Son, Inc., Joseph T..115

St. Louis Tech. Institute.....116
Schaefer Brush Mfg. Co.....113
Scott-Newcomb, Inc. 91
Scovill Mfg. Co., Morency Van Buren Division 73
Skilsaw, Inc. 102
Skuttle Humidifier Co., J. L.... 71
Stanley Electric Tool Div., Stanley Works, Inc.....107
Superior Sheet Steel Co..... 13
Surface Combustion Corp..... 73
Swartwout Co., The.....107
Swift Corp., Carl E.....116

Tuttle & Bailey, Inc..... 77
Twentieth Century Heating & Ventilating Co. 113

U. S. Steel Corp..... 7

Victor Electric Co..... 85
Viking Air Conditioning Corp. 47
Viking Shear Co.....113
Voorhees, G. A.....116

Ward Machinery Co.....106
Waterloo Register Co., The... 36
White Mfg. Co..... 82
Whitney Mfg. Co., W. A.....111
Whitney Metal Tool Co.....112
Wickwire Spencer Steel Co....111
Wiss & Sons Co., J.....113
Wodack Elec. Tool Corp.....116
Wolff & Co., Benjamin.....105

XXth Century Heating & Ventilating Co. 113

Youngstown Sheet & Tube Co. 16

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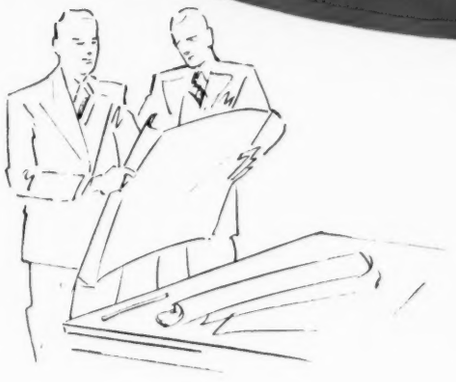

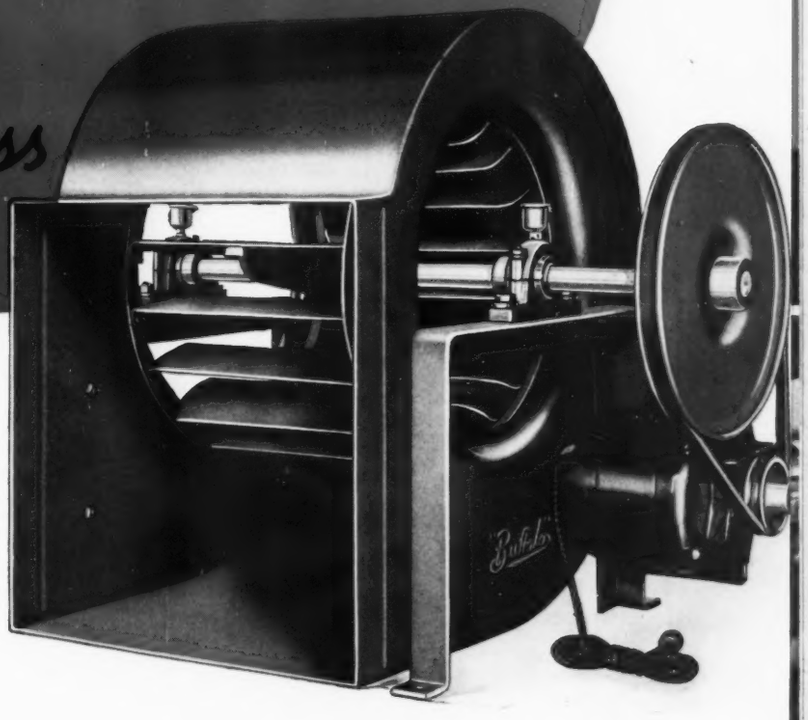

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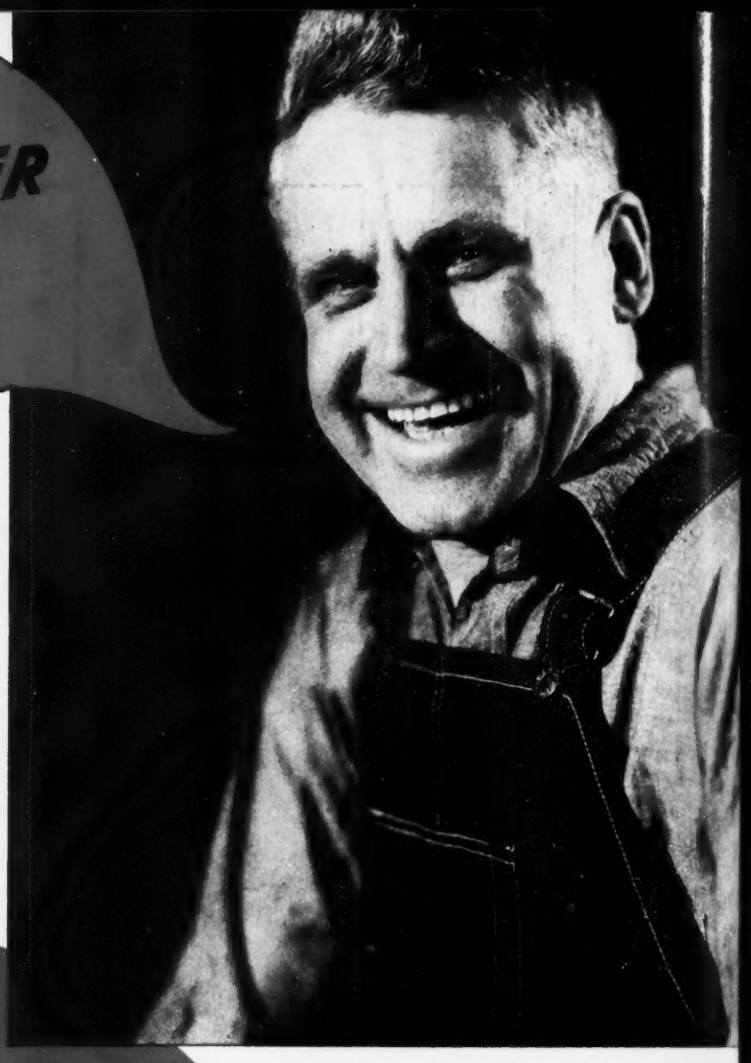

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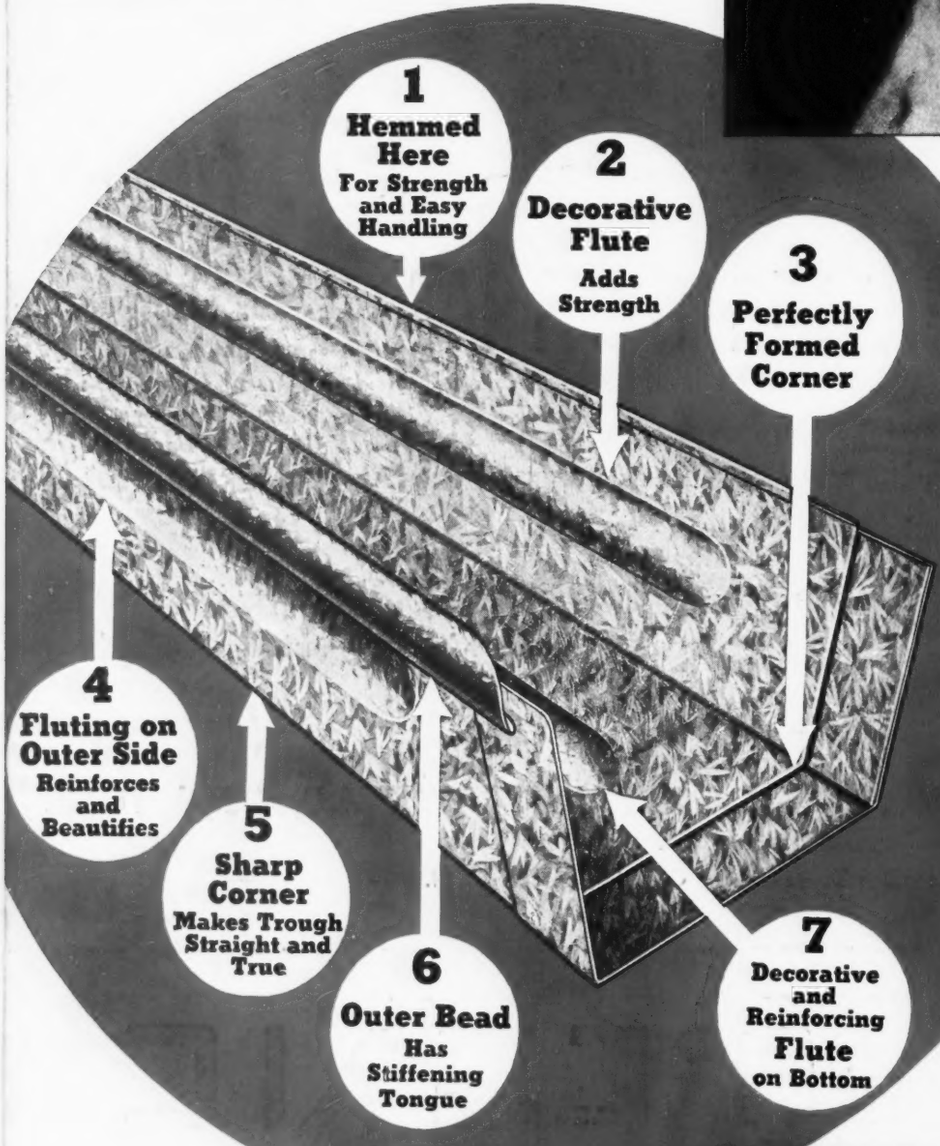

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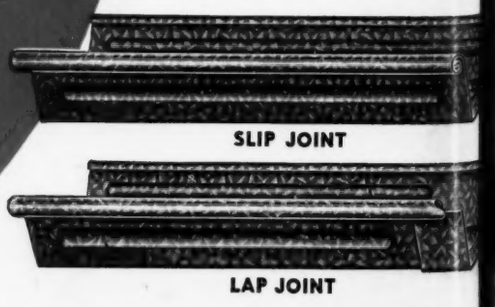

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